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Volume 10 Number 5

CONTENTS

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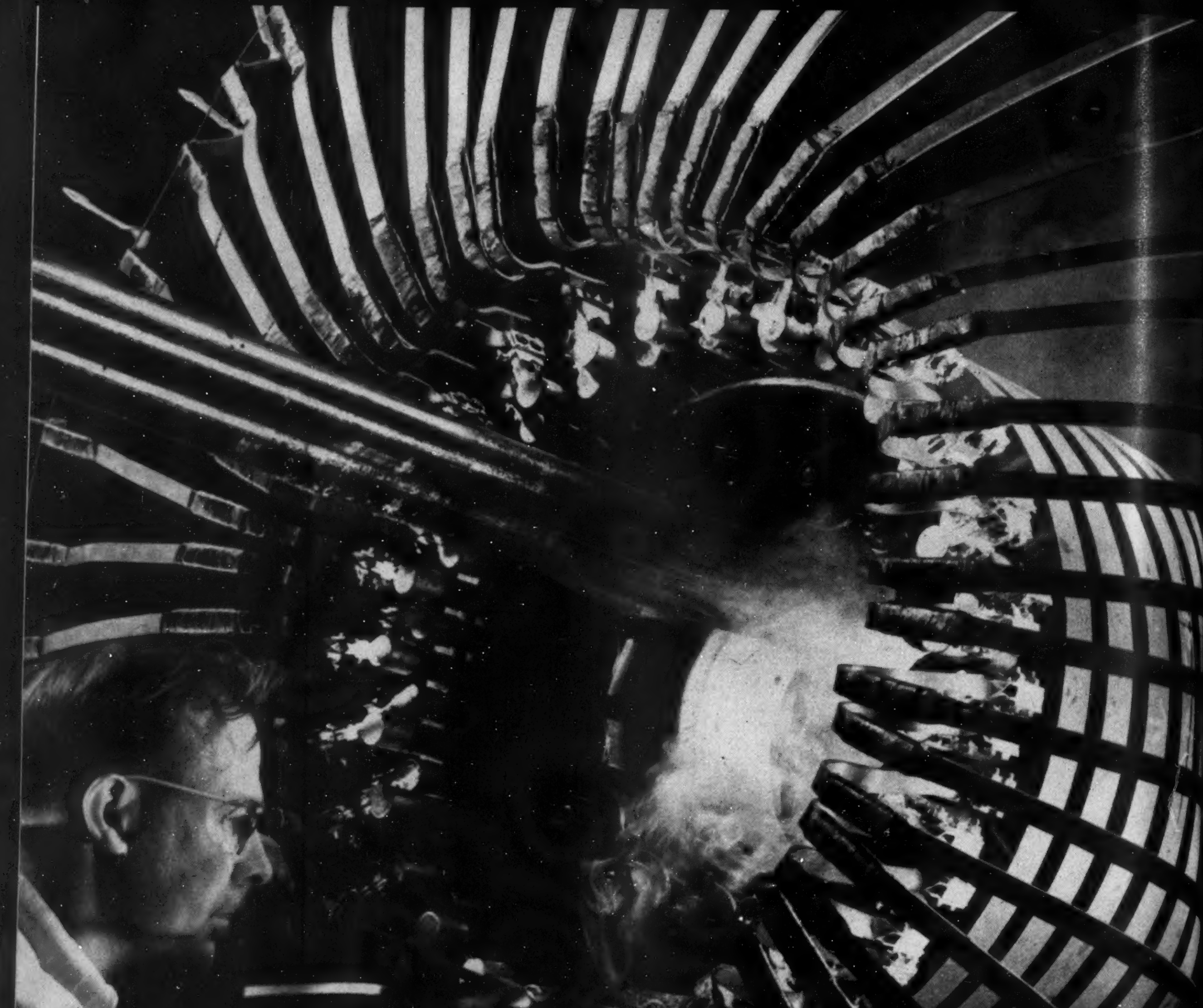

The copper leads of this collector for a synchronou converter are stretched out like a huge spiderweb during manufacture. —Courtesy We

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Professors on Pro?

WHEN a Cornell student does work of a quality below a certain minimum standard, he is put on probation, or "pro." If, during a subsequent period, his marks do not improve, he is generally "busted out." This form of scholastic discipline has always been extremely distasteful to Cornell students because "pro" meant no more extra-curricular activities while "bust out" meant either transfer to another college or else a full term of scholastic inactivity before re-entrance to Cornell. But nowadays the majority of the students are in the Navy V-12 program and to them the above expressions take on even more significant meanings. "Pro" means no more weekends out of town to relieve the monotony of campus and dormitory confinement; an end to late Saturday night dating; and no more recovery of lost sleep on Sunday mornings because of required attendance at a group study session. "Bust out" means separation from the V-12 program with accompanying disruption of immediate Naval and eventual business careers.

We wonder if all of the professors and instructors realize the seriousness of the situation. We especially wonder about this when we see a few of them walk into a class room and present the day's lecture like a baker selling a loaf of bread, but without half the personality and friendliness of the average baker. We wonder about this when a few of them turn intelligent questions to one side because these sidelights disrupt the professor's standard routine for presenting his lesson. We wonder also, when we travel, on one of those increasingly rare occasions, to the prof's office at the proper time and then find him too busy with important trifles to answer our questions —or else not in his office at all.

It is no surprise that the "pro" list is getting larger and larger. Some of the students are becoming mentally fatigued from the intensive grind of an accelerated program; some find the question of their immediate future so much in doubt that they give up the game; and some are finding engineering less and less interesting, more and more boring—partly due to professors who apparently do not care if the men in their classrooms ever become good engineers.

The number of professors in this painful category is small, probably less than ten per cent. But few machines can work properly if ten per cent of the gears have broken teeth. A repair job is necessary.

Right here and now these fellows seem too secure to be budged. One reason for their security is the current shortage of good educators. Also, students in the Navy are not in a position to openly criticize their professors. In civilian days, a slightly more potent cry could be raised against poor men, especially in liberal arts colleges, where the less brilliant professors were singled out over a period of years by an enrollment in their particular courses which eventually dropped to such a low value that the professors found it wise to seek employment elsewhere. In most cases it meant that the school had profited as a result of the separation.

Another method of selection, which has been tried at other colleges, might be workable in the present and probable future situation. This would consist of a periodic "unpopularity contest" in which the students would vote for the professors they thought had the poorest personality, interest, knowledge of subject, and teaching ability. If a man received a large number of votes against him and if he was of little value to the university along the lines of research, his case would be reviewed by a board of alumni, faculty, and students. He could either be put on confidential "Pro" in anticipation of probable improvement, or else he could be "busted out," fired, like unfit men in other professions.

Probably the best solution to the entire problem would be to suddenly find that the problem was no longer existent. Perhaps as powerful a threat as dismissal would bring the small minority of poor professors out of their indifference and cause them to strive for the high level of excellence held by the majority of Cornell professors.

—C.C.H.

PHYSICAL METHODS IN PRODUCTION CONTROL

By DR. HENRI S. SACK

Associate Professor for Physics of Engineering Materials

AS a little boy, while living near a railroad line, I dreamed of becoming, someday, one of those maintenance crew members who walks along the track and detects defects in the rails by tapping them with a hammer. I thought it very romantic that the fate of a whole train and the lives of many people depended on the ears and experience of a single man, and I saw myself running in a blizzard along the track with a red lantern in order to stop a train before it reached a defective spot which I had just detected.

Fortunately, I finally did not choose this profession, because there would be a big chance that by now I would be jobless, or would be so in the near future. Today, the detection of defects in rails can be done automatically by a detecting device mounted on a car and rolling over the rails with a speed of 6 mph. Whenever a fissure in the rail is passed, paint is sprayed on that spot and a recording instrument inside the car marks a rail chart. This result is obtained with the help of modern physics, and it is a good example which shows how physical principles can help in industrial control problems.

A Tremendous Task

This rail testing car is only one example out of a great number of cases where physical methods have improved existing control devices or have made new ones possible. But in spite of much that has been done in modernization of industrial control operations, there is still a tremendous task to be done. There are still many millions per year wasted and many lives lost due to lack of adequate controls. Examples are numerous where considerable damage has been done by failure of a single bolt, by overheating of a single bearing, by undesired presence of traces of moisture. There is hardly an industrial field where controls cannot bring savings or improvements.

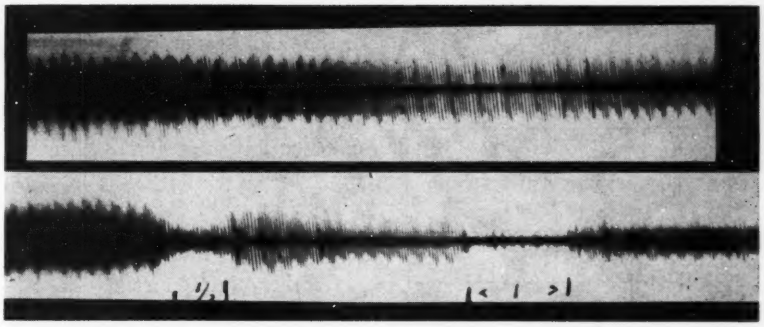
Physical methods have been used in this field for a long time, mostly, however, in the form of simple devices, such as thermocouples, pyrometers for temperature control, lever-systems for dimension measurements, etc., and it is only recently that full use of the advances in physics has been made in the development of industrial controls, in particular of automatic units. Two main reasons seem responsible for this fact. The first is that the need for fast and reliable control devices has increased tremendously because of higher requirements for quality and quantity of production (lowering of security factor, saving of manpower). The second is, that, in order to transform a sometimes delicate laboratory apparatus into a workable technical device, certain elements, such as electron tubes, phototubes, relays, special motors, etc., are indispensable, and many of these elements—also based on physical principles—have themselves only been developed within the last 10 to 20 years.

In fact, there are two distinct steps in designing a control unit; namely, the choice of the physical

In appearance not much different from any service car, this test car contains a mechanism (right) sensitive to defects in the rails over which this car is moving at 6 m.p.h. The presence of fissures in the rails will disturb the normal distribution of currents and their magnetic fields, set up by this device, and produce a needle deflection recorded on a band moving across the observation table (far right) with a speed proportional to that of the car.

—Courtesy Sperry Products Inc.

principle on which the device operates, and its technical realization. The first one needs as wide a knowledge of physics as possible; the second one requires engineering skill which also often needs application of physics. Only a thorough study of both phases, and a well chosen combination, will finally lead to a device which will fulfill the many conditions to which modern controls are subjected: precision; reliability, even under adverse external conditions (vibrations, dust, temperature changes); simplicity; no need of specially trained personnel; automatic functioning; and fast action.



Reproductions of the "sonograms" of two test pieces, the upper one being in perfect condition, the lower one containing two fissures, one ½" x ¼", the other 1" x ½".

Chemical Dependence

It is not possible to give, within the scope of this article, a complete account of all the physical methods used in this field of applications. Only a few examples can be given. One important group of devices deals with the control of the chemical composition of a substance, a special case being the detection of impurities. A great number of physical methods can be used, all based on the dependence of physical properties on the chemical composition. Such properties are: dielectric constant, permeability, emission and absorption of light (of all wave lengths, including x-rays), fluorescence, refractice index, and others. Even more complex phenomena, such as the deflection of beams of ions in electric and magnetic fields, are used in the form of the fass-spectrograph. The final choice of the method depends on the particularities of the problem. For instance, the dielectric constant is suitable if the impurity is what we call a polar substance (its molecules are electric dipoles), and the substance under test is nonpolar. In this case a small addition of the impurity will change the dielectric constant considerably. For example, pure dioxane has a dielectric constant of 2.20; the addition of 0.6% of water will increase it to 2.40. The dielectric constant itself can be easily determined to considerably better than 1% by measuring the change of the capacity of a condenser containing the substance, and there are several means in use which give an automatic recording of these changes. As water is a substance of rather high polar character, moisture content measurements can be made by this method.

Spectroscopic Methods

Often, the dielectric constant of the sample cannot be measured conveniently, as in the case of solids of irregular shape (e.g., powders). Under these conditions a hygroscopic substance may be brought in contact with or in the vicinity of the sample, and the change of dielectric constant of this indicator recorded. This "indirect" method of moisture control is used for example, in the case of flour, paper, etc. The dielectric method has the disadvantage that it does not give specific information about the kind of impurity present. Here, spectroscopic methods can be of great value. They are based on the fact that each substance has a characteristic emission, absorption or fluorescence spectrum which, so to speak, forms its fingerprint. In obtaining, therefore, a spectrum of a sample and by measuring the wave lengths at which the lines or bands appear, conclusions can be drawn as to what substances are present in the sample. If, in addition, the intensity of these bands is observed, quantitative determination of the amount of each component can be obtained. Such a method has been used for a long time in the chemical analysis of alloys. Here, the emission spectrum, obtained by a spark or an arc between electrodes made of the sample in question, is photographed and then interpreted with

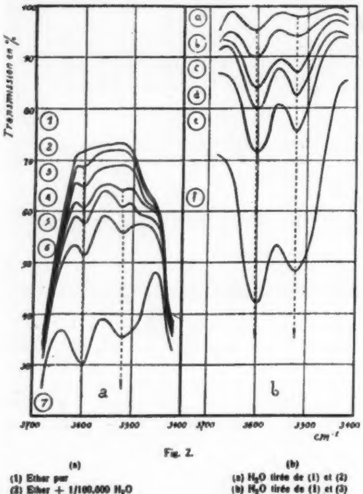


Fig. 2.

(a)

(1) Ether pur
(2) Ether + 1/100.000 H_2O
(3) Ether + 2,6/100.000 H_2O
(4) Ether + 6,6/100.000 H_2O
(5) Ether + 9/100.000 H_2O
(6) Ether + 21/100.000 H_2O
(7) Ether + 50/100.000 H_2O

(b)

(a) H_2O tirée de (1) et (2)
(b) H_2O tirée de (1) et (3)
(c) H_2O tirée de (1) et (4)
(d) H_2O tirée de (1) et (5)
(e) H_2O tirée de (1) et (6)
(f) H_2O tirée de (1) et (7)

Epaisseur : 1 m/m.
Temperature : 20°

These infra-red absorption spectra of pure ether and of ether plus different amounts of water show clearly the double absorption band of the water increasing in intensity as the water content increases. (From Bull. Soc. Chim. Belge, Vol. 48, 1939).

the help of certain standards. The whole procedure, if well organized, takes only a few minutes. In recent years the infra-red absorption spectrum has been used more and more. The advantage lies in the fact that the infra-red spectrum of organic substances is, in general, simpler and easier to interpret than the much more complex spectra in the visible or ultra-violet. Due to modern amplifier and recording systems, the technical difficulties in obtaining these infra-red spectra have been largely overcome and reliable self recording instruments are now available. Under favorable conditions, the sensitivity of this method can be extremely high. The accompanying figure may serve as an example. Here, an attempt is made to determine the presence of traces of water in ether. The left half of this figure gives the intensity of light after passage through the sample contained in a thin quartz cell, as a function of the reciprocal of the wave length. Even for concentrations as small as 1/100,000 a distinct decrease in intensity (increase in absorption) occurs. In order to make this clearer, the right half of the picture shows the ratio of the light intensity at a given concentration divided by that of the pure substance. It is clearly seen that the absorption consists of two bands, and it is water only which will produce these two bands. This high sensitivity to concentration and chemical character cannot be matched by any simple chemical control method. There is no difficulty in principle in building, on the basis of these observations, an automatic moisture indicator.

Another optical method—in certain cases an extremely sensitive one—is the observation of fluorescence. For instance, traces of mercury vapor in air can be easily detected. In the field of more complex organic chemistry, the vitamin B_2 content can be easily controlled by this method.

Moisture Determination

Sometimes, the choice of a method is dictated by additional, external conditions. An example is the determination of the relative moisture content of air in a vacuum evaporation system where the pressure during the operation is changing considerably. All the methods indicated above, though very sensitive for the determination of moisture in air, will be inconvenient because the measurements are not a direct measure of the relative moisture content but have to be corrected for the pressure. One of the few direct methods is the determination of the heat conductivity. In fact, the heat conductivity of a gas varies only very slightly within a considerable pressure range, but is sensitive to the chemical composition of the gas. Again there exist good technical means of recording changes in heat conductivity (e.g., modified Pirani gauge in a bridge circuit), and such control units have been proposed for certain gas analysis problems.

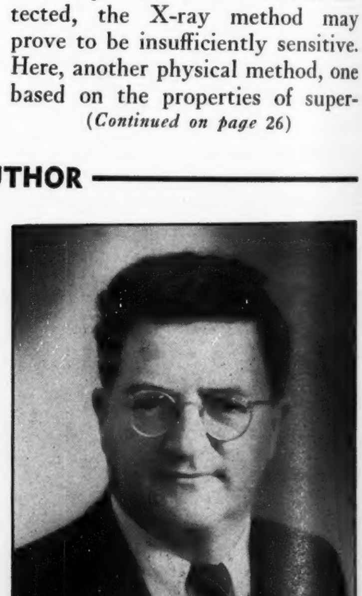
A second group of problems deals with the elastic properties of a finished product. Of particular importance is the control of those factors that may lead to premature failure. One of these factors is the existence of fissures, blowholes or other occlusions. A very successful and widely used method is X-ray-radiography. It is based on the fact that air absorbs X-rays much less than a metal, like steel. Places where holes occur will, therefore, appear on the photographic plate darker than the surroundings. The observation can be made by fluorescent screen, or by photography; the latter method is more sensitive, but needs more time. In many cases good sensitivity and immediate recording can be obtained by using other indicators for X-ray intensity; namely, ionization-chambers or counters. So far, however, such methods are not used to any great extent, and nearly all testing is done by photography.

If very thin fissures are to be detected, the X-ray method may prove to be insufficiently sensitive. Here, another physical method, one based on the properties of super-

(*Continued on page* 26)

THE AUTHOR

Dr. Henri S. Sack received his degree at the Eidgenossische Technische Hochschule, Zurich, in 1927. From then until 1933 he was with the Physics Department of the University of Leipzig, as head assistant of Professor P. Debye (also at Cornell now.) Dr. Sack held a Fellowship at the University of Brussels from 1933 to 1935, and remained there with the Department of Physical Chemistry until 1940, when he came to Cornell as a Research Associate in the College of Engineering. Last year he was made Associate Professor of Physics for Engineering Materials. He has written about 40 technical papers.



Dr. Sack

RADAR HISTORY

By JACQUES L. ZAKIN, ChE '47

IN November 1942, when the sea battle for Guadalcanal was still undecided, an American warship was searching for Japanese vessels. Suddenly the radio-locator showed enemy ships to be about eight miles away. The warship opened fire and, on the second salvo, hit the target squarely. Our ships went on to win the battle and disastrously rout the Japs.

This battle, and perhaps the entire war, might have been lost save for a group of naval scientists who worked for years perfecting a device for radio detecting and ranging. The Navy code word, radar, was taken from the initials of "radio detecting and ranging." The reason for secrecy was that, although the Army and Navy knew the Germans had a similar device, they believed ours to be better. Therefore, mention of it was taboo until April 1943 when a joint Army-Navy release announced the existence of radar. Radar might yet be a secret were it not for the fact that at the time skilled men in the manufacturing plants concerned were being drafted and more recruits were needed to operate the device. Draft boards had to be informed that skilled radar men were to be deferred; also, publicity was needed to get recruits. Thus, the veil of secrecy about radar was partially dropped.

Working Together

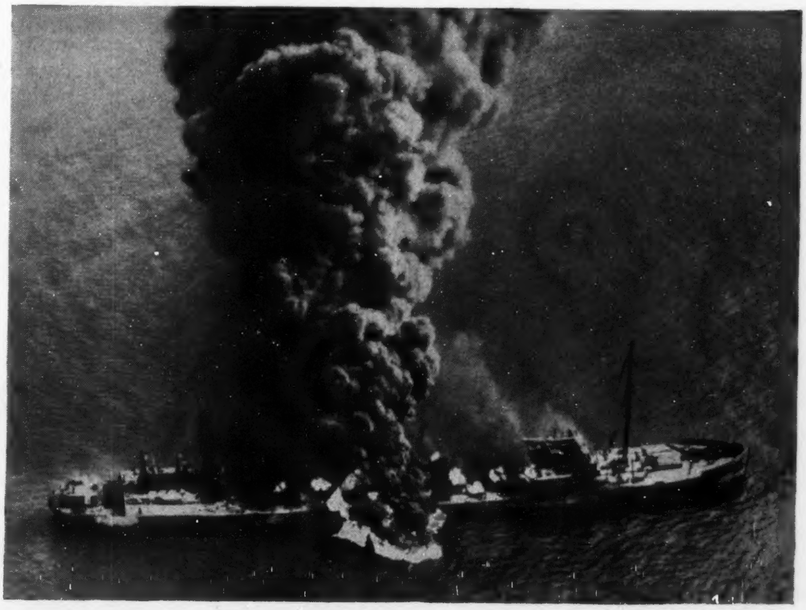
The early leader in the work on the detector was Albert Hoyt Taylor, now Chief Navy Physicist. During the last war Leo C. Young, Louis A. Gebhard, and Taylor worked together, and after the war they were assigned to Anacostia Naval Air Station where they were to do research on the improvement of interplane and plane-ground radio communications.

By the summer of 1922 some improvement had been made in equipment and methods, but there was still much to be desired. Taylor and Young were broadcasting short waves from a fixed transmitter on one side of the Potomac to a portable receiver on the other side. They noticed that ships moving up and down the river distorted their signals. This discovery was to be the basis for all later work in radar.

Navy Memorandum

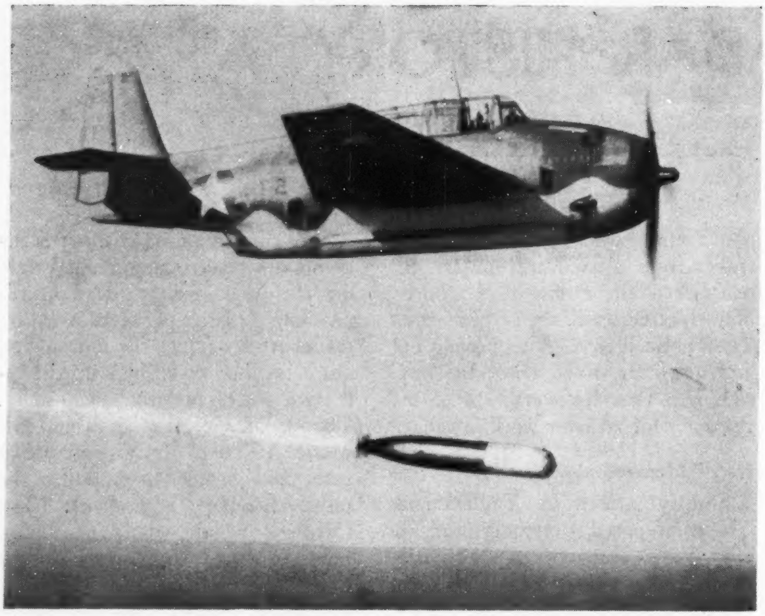
Shortly afterward Taylor and Young prepared a memorandum to the Navy Department in which they proposed the use of radio detectors aboard Navy ships. They suggested that destroyers operating in parallel lines several miles apart could easily discover the presence of an enemy between them regardless of visibility. The present use of radar in convoying ships is very similar to the original proposal. At the time, however, their proposal received little or no attention.

In 1925 Gebhard developed a new transmitter embodying the electronic "pulse" principle now used in radar. By broadcasting high-frequency pulses, greater radio energy could be used without blanketing out receiving equipment during the weak echo's period of reception. A series of waves could be transmitted against the ionosphere, and a receiver could pick up the reflected waves between each pulse. Young, Dr. Gregory Breit, and Dr. Merle A. Tuve of Carnegie Institute collaborated in building the pulse-receiving equipment. The Carnegie people used the equipment to study the earth's electric roof, later named the Kennelly-Heaviside layer. These experiments were reported in international scientific journals, and, as a result, the British began work in the development of a radio locater. It is quite probable that these reports also gave the Germans the same idea. In June 1930, Taylor, Young, and L. A. Hyland were working on a new high-frequency blind-landing idea. Hyland was receiving and Young transmitting. There seemed to be considerable unaccountable interference, so Hyland checked his equipment. Everything was in order, and he was pondering over this



—Courtesy General Electric

Submarines use radar to detect enemy shipping. A torpedoed tanker goes up in flames.



A U. S. Navy TBF-1 torpedo bomber cuts loose its deadly cargo. Radar aboard the mother carrier can detect the enemy at a great distance without the use of scout planes, thus preserving the element of surprise.

when he noticed that the interference occurred only when a plane was overhead. They were all pretty excited then, for they realized that they had something that could limit the effectiveness of an airplane's surprise attack.

In November 1930, Taylor prepared a comprehensive report of all the work done on radio detection up until that time and submitted it to the Navy Bureau of Engineering. It was called "Radio-Echo Signals from Moving Objects" and gave tactical suggestions for the detection of ships and planes. Within two months a communication was received telling them to continue their research and to keep the results confidential.

Bouncing Radio Waves

For several months Taylor and his associates, including Carlos B. Minck, director of the Naval Research Laboratory's aircraft radio section, bounced radio waves off of planes. The equipment for these waves was clumsy and unsuited for use aboard ships. Young suggested that high-frequency pulses similar to those used in the Kennally-Heaviside experiments be used. He began work on this idea and worked alone for several months. Robert M. Page was sent to help him, and later, when Young was transferred, Page carried on. Robert C. Gutherie was then sent to work with Page.

Page and Gutherie had the job of applying the various bits of information that had been gathered together before that time to perfect a device for picking up planes and giving their location, speed, and angle of approach. Their work was frequently interrupted by other assignments, but nevertheless, a set was completed which gave limited results. Several months later, a second set was constructed, and it gave satisfactory results—that is, it detected planes up to about five miles. A third set was even more successful, it picked up planes within a radius of 50 miles. In April, 1937, radar was tried over salt water aboard the destroyer Leary. Once again it lived up to all expectations.

The Black Widow, Northrop P-61, uses radar to track down its prey at night. The plane's advanced gunnery system includes four .50 caliber machine guns controllable by gunners in the rear or the front compartment.

—Courtesy General Electric

In March, 1938, when radar could be used up to 50 miles, Gebhart was put in charge of a group to develop plans for an instrument which could be manufactured commercially. This work was completed, and in October of 1939, RCA received the first contract to produce radar. Gutherie was put in charge of installing the equipment produced. At present all the large electronic equipment companies are doing research on radar.

In 1940, a British technical mission came to this country to compare ideas with American scientists. It was found that they had developed a radio-locator very much like our own. The credit for this goes to Sir Robert A. Watson Watt, a Scotch physicist, who worked alone for several years on this project.

Though radar has been talked up as a weapon vitally important in winning the war, it is also an instrument which will prove very valuable in peace. No longer will ships have to fear collisions in fogs. Radar can spot and locate any approaching object miles before it comes close. The pulse altimeter, a device for measuring the absolute height of an airplane above the ground by reflecting radio waves from the ground back to the plane and measuring the time interval, is a variation of radar which has been in use for several years. These and other uses for radar will be a lasting tribute to the courageous group of scientists who worked so long and so hard before they were successful.

ON THE AIR!

By BILLIE P. CARTER, ChE '48

Photographs by N. W. Burlis

ON the air!

"This is Radio Cornell, CRG with studios in Willard Straight Hall on the campus of Cornell University, Ithaca, New York." With these words, CRG, the station of, by, and for Cornell students, signs on the air to offer an hour or more of varied entertainment to Cornellians. Music of all kinds, dramatic productions, the "Request Show," and original programs make up CRG's daily schedules.

History and Development

Cornell has been a leader among colleges in radio transmission and experimentation. The first Cornell radio station was established in 1922, using the call letters WEAI. In 1927 the University was given modern equipment, including transmitters, towers, and buildings to house the broadcasting. The Elmira Star Gazette newspaper leased the station for their own use in 1932, changing the call letters to WESG. Cornell canceled this lease after 8 years, and again entered the field of radio operation. Station WESG, broadcasting on a frequency of 850 kilocycles and with 1,000 watts of power, had its main campus studio on Garden Avenue, South of Bailey Hall. Programs from other studios, and from centers in Ithaca and Elmira were brought by direct wire to the campus transmitter. Broadcasts were made of debates, prize-speaking contests, performances by musical groups, and other campus activities.

The first Cornell Radio Guild was organized in 1936. It was limited in its broadcasts to a regular Sunday evening program of campus interest on station WESG. In the early part of 1940, the idea of giving the Guild its own outlet was first thought of by J. Robert Meachem and G. Emerson Cole. This idea was realized when, in November, 1940, Cornell Radio Guild began operating Station CRG.

The basic idea underlying college broadcasting of this type is the use of a small transmitter capable of covering one building with a frequency located in the standard broadcast band. This enables the people in the building to tune the station in on a standard receiver as they would any other broadcasting station. A centralized studio serves the small transmitters by supplying the programs, which are fed to the transmitters by wire line, and are converted to radio frequencies by the transmitters.

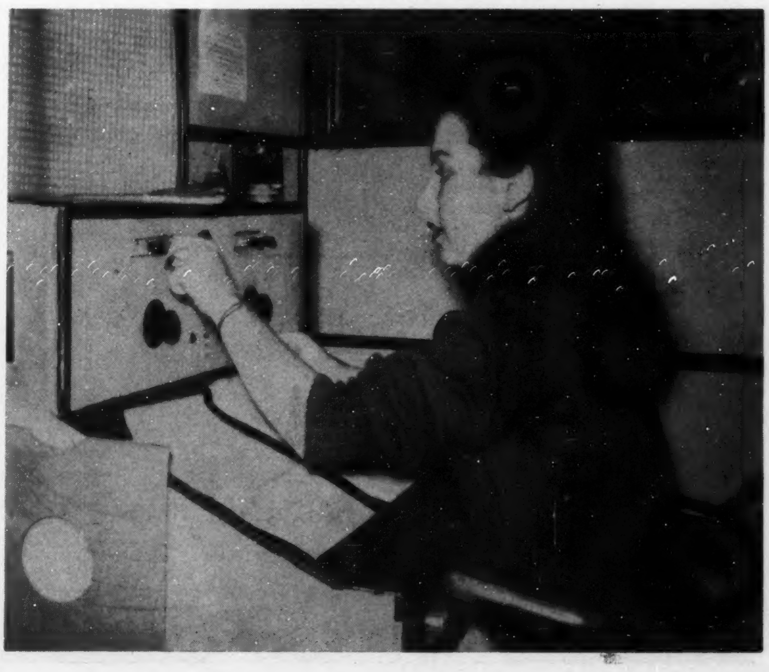
Many types of commercial oscillators of the wireless phonograph type were tried in several of the University dormitories. These tests were made to determine the optimum mode of coverage and frequency . In the course of these tests was noted the most effective method of coupling the oscillator output to some antenna system in a building in order to get optimum coverage. Most satisfactory results were given by a wireless phonograph type oscillator using the heating pipe network for the radio frequency distribution. By checks on several broadcast receivers and by a few oscillator tests, the clearest channel was determined to be at 640 Kc., which has remained CRG's frequency.

The First Broadcast

On Thanksgiving Day of 1940, the first broadcast was made with a single oscillator installed in Cascadilla Hall. In spite of the limitations, it was a success. From then on, increases in the station's coverage were made with the installation of additional oscillators located in other dormitories. By the Spring of 1941 oscillators were located in all the dormitories. This was followed in the Fall by the additional coverage of twenty fraternities and sororities, each being served by its own oscillator.

As the system grew, difficulties of this type of transmission became more apparent. Periodic mainten-

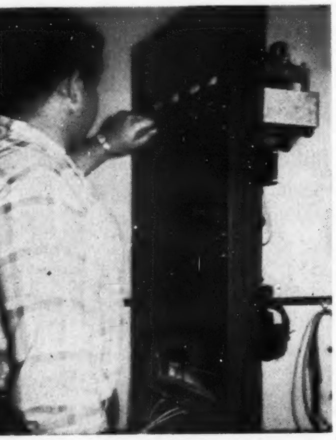
One of CRG's members announcing in the sound-proof studio in Willard Straight Hall.



ance of the many small transmitters was a problem, and the network of telephone lines to feed these units became a financial burden. This wired network was no longer able to give adequate coverage when the men's dormitories and many of the fraternity houses were taken over by the service men, forcing civilian students to live outside the campus in a much less concentrated body. Necessitated by this problem, a second search was made for a more efficient type of distribution in the Spring of 1942. A system employing one large transmitter to serve the entire campus and surrounding area was tested. The experiments were carried out in Willard Straight Hall with an amateur transmitter coupled to the 2300 volt power lines for radio distribution. The results were so good that this was decided to be the solution to the immediate problems.

The technical staff, endeavoring to build a transmitter and obtain the necessary equipment to meet underwriter requirements for coupling the unit to the 2300 volt mains, met its greatest difficulties because of wartime restrictions. The equipment needed in University transformer vaults was impossible to procure without high priorities. The problem was solved with the location of the transmitter in the power room of the Senior Electrical Laboratory in Rand Hall.

In the early Spring of 1943, operation with the new installation began. At present there are four studio channels and two microphone channels installed. The studio channels lead into the master channels, which lead into line amplifiers over telephone lines to Rand Hall and the Infirmary. Installed in the Infirm is a local oscillator attached to the 110-volt system. The areas covered at present are Fall Creek and adjacent regions and the Infirm. Willard Straight Hall is wired with CRG lines so that programs originating from almost any part of the building may be relayed to the studio with the remote broadcasting equipment. Broadcasts of special events in Barton Hall, such as the big dances or games, are made possible with the permanent remote line.



The switchboard panel, constructed and operated by CRG's student engineers.

CRG's studio is located in Room 16 in Willard Straight Hall. Robert Meachem designed the wiring and control board system, while Cole undertook the job of converting the room into an adequate studio. First an elevated control room floor was laid, and sound-proofing was placed over the existing walls. A new partition was constructed, separating the control room from the studio, and containing a window and door, all insulated against sound. The control room now contains a rack with power supplies, amplifiers, and the control board. In the studio are the microphones and the two phonographs, with approximately 900 classical and 700 popular records close at hand.

Unique view of the studio and control board, as seen from the control room.

Personnel

Because of diversified conditions, the number of CRG members varies; at present, there are approximately ninety. The guild is subdivided into a number of committees: engineering, announcing, production, publicity, sales, and continuity. The sound effects engineers handle all sound effects for productions, making use of campus talent when necessary. The technical engineers keep the equipment in shape, and the studio engineers "push the buttons" for each broadcast. The production and programming committee has the job not only of planning the daily radio schedule, but also of devising and producing new programs.

Production

A great variety of productions is presented during CRG's broadcasting hours from 5 to 6 P.M. and 7:30 to 11 P.M., Monday through Friday. Newscasts and Campus News keep Cornellians posted. An especially popular program is the "Request Show," which plays and dedicates all requests within reason. One unfortunate episode occurred when a student practical jokester called in to request "The Sorcerer's Apprentice" be dedicated to E. Maret, and gave his name as G. E. Grantham. Don Townsend conducts several original programs of old and new jazz which are special features of CRG. Dramatic productions are produced, directed, and acted out by the members.

Outside of its regular hours CRG broadcasts special Cornell events.

(*Continued on page 42*)

PROFILES

Of Outstanding Alumni

JOSEPH PIERCE RIPLEY, M.E. '12

FROM a jungle of weeds, rusted iron, rotting ways, and derelict buildings into a thriving producer of fighting ships for the U. S. Navy: this ten month's transformation in 1940 and 1941 of Philadelphia's Cramp Shipyard was largely due to Joseph P. Ripley, M.E. '12. The organization in 1928 of a number of related aircraft industries into one unit, which grew and thrived until its eventful dissolution in 1934 into the separate transport and manufacturing companies now known as Boeing Airplane, United Aircraft, and United Air Lines, was another gigantic feat of successful corporate organization which was largely due to the work of Mr. Ripley.

A glance at his record will show that Ripley's achievement of fame is no sudden skyrocket to prominence; nor is his life a rags to riches struggle. Rather, his entire story, from high school graduation onward indicates that he was obviously headed for attainment of great success. Pre-graduation field experience in railroading, outstanding scholastic attainment and varied extra-curricular interests at Cornell, and a gradual accumulation of executive experience by serving in various capacities with a number of firms—these things all pointed toward the eventful achievement of some high goal.

Mr. Ripley was born in Oak Park, Illinois, in 1889. He attended high school there and upon graduation immediately stepped into the engineering field by taking various jobs on railroads before and during undergraduate days at Cornell. It was only natural that he should enter railroading, since his father, Joseph Trescott Ripley, was a committee chairman for Western Railroads. J. P. Ripley's practical training began as an axeman employed with an engineering construction party engaged in building the Belen Cut-off of the Atchinson, Topeka, and Santa Fe Railroad in New Mexico. Later he entered the employ of the Grand Trunk Pacific as a rodman with an engineering party in Alberta, Canada, continuing in that capacity until he was transferred to the Copper River Division of the Grand Trunk in Northern British Columbia as transit man. His association with railroad work was maintained after entrance to Cornell; during his summer vacation periods, he worked with the Santa Fe Railroad as an assistant engineer, and twice he received leaves of absence from Cornell to participate in special locomotive tests out West.

Mr. Ripley's undergraduate days at Cornell included many extra curricular activities. Among these were Beta Theta Pi fraternity, Tau Beta Pi, Sphinx Head, Aleph Samach, Gemel Kharm, Student Conference Committee, and Manager of the unbeaten Cornell Crew of 1912. He graduated with high scholastic honors, having in his junior year won the First Sibley Prize in Mechanical Engineering.

After leaving Cornell, Ripley immediately entered the employ of J. C. White & Company, Inc., New York City, where, over a ten year period, he held various positions in the Operating Department. During his stay at that company, he was appointed a member of the Financial and Commercial Commission, sent by the Secretary of the Treasury to visit all the Central American Republics. He remained with the White organization until he accepted an appointment to the buying department of W. A. Harriman & Co., Inc., of which he was soon elected Secretary. Mr. Ripley left Harriman to enter the Industrial Department of the National City Company,

(Continued on page 28)

Mr. Ripley

Engineering At Cornell

4. Chemical Engineering Laboratories

By RODERICK PEARSON, ChE '47

Photographs by R. C. Reese

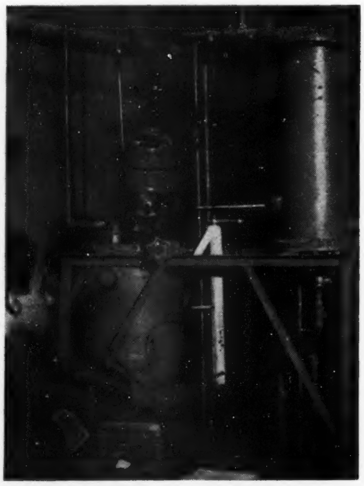
ASIDE from the literary standpoint, the main criticism of this article will probably be that the treatment of such a serious subject as the Chem.E. Labs at Cornell has been handled in too light a vein. But I feel that if you actually live and work with the students themselves, you will realize that in their slightly humorous approach to their work they absorb more actual appreciation of the value of their training than that type of student seen too frequently on this campus. This is the breed that begins a course with serious intent of learning more about it than the professor in charge already knows, and with the admitted (not avowed) object of revolutionizing the industry with his discoveries. Not that the average Chem.E. isn't serious about his work he has to be or he wouldn't stay in the chemical engineering school very long.

The "710" Laboratory

One topic which the entering freshman in the Chem.E. School never gets away from is the horror of "710". For several terms he (very seldom is it 'she') wanders around the school, learning the ropes, not knowing just what this "710" really is, until one night he is involved in a bullsession and is rudely treated to the facts of life. Actually, however, this business about the nights spent on "710" reports is only a myth spread by seniors with the intent of snaring unwary underclassmen. When doing these reports one spends not weekends but month-ends.

To approach the subject from a serious side, "710" is a course given in the three-story Unit Operations Laboratory, and occupies a whole wing of Olin Hall. It is large enough to give full play to the program of constructing pilot plants for study, in actual operation, on a scale allowing accurate estimates of the performance of full-size commercial plants.

The laboratory is equipped with such basic units as evaporators, heat exchangers, filters, extracters, and filter processes. To provide the necessary head room for some of the taller pieces, one large section is completely free of horizontal divisions. It is serviced by a tra-



A student in chemical engineering experiments with filtration.

velling crane. The construction and repair of all this equipment is provided for by a pipe shop, a machine shop and a wood shop on the basement floor. Also on this floor is an analytical laboratory for use in conjunction with the Unit Operations Laboratory.

One of the main purposes of the Unit Operations Laboratory and the lecture course (705) given in connection with it, is to acquaint the students with certain types of machinery found in actual plants. When a freshly-graduated chemical engineer gets a job in industry and he is confronted with the problem of how to run an evaporator, for example, he would be much better fitted for the job if he understood the principles of operation of the evaporator and had manipulated similar, if smaller, units during his training at college. A second and equally important aim is to imbue the prospective chemical engineer with a working knowledge of the physical principles governing the use and operation of various standard chemical units; in other words, to show them why as well as how the apparatus works.

Report Writing

In the lecture course which he conducts in Unit Operations, Dr. Fred H. Rhodes, now Herbert Fisk Johnson Professor of Industrial Chemistry and Director of the School of Chemical Engineering, carries out his belief that chemical engineers should learn how to write reports well enough so that someone not directly acquainted with the work they are doing can read the report and obtain a concise analysis of the experimental results obtained without having to translate individual shorthand and perverted grammar. The course given at Cornell is very thorough, as thorough perhaps as any similar course in the country. However, all chemical engineer students aren't struggling with "710". As a result of the revolutionary fact unearthed in a recent nationwide poll that, of every thirty chemical engineers graduating from Cornell, roughly 2.8 end up using a microscope in their work, all students are required to take Professor Mason's course in chemical microscopy, referred to affectionately as "micro". The "micro" lab., situated comfortably on the third floor of Olin, away from all the bustle and activity of the "710" lab., finds a group of men working busily over their 'scopes, not looking at bugs, but watching the phenomenon of crystal formation and the beautiful color displays incident with polarized light. No cases of eyestrain have been reported, although it has been rumored that

some junior chemical engineers have been seen crawling about disjointedly mumbling "I'm a little crystal, watch me grow." Crazy? —not at all. Just trying to finish "micro" before the end of the term.

It might be added that Professor Mason has a class of Naval officers taking a post-graduate course in the microchemistry of explosive materials, a field in which the Professor is nationally recognized.

Advanced Students

Perhaps most looked forward to of all the chemical engineering labs are the small unit laboratories for use by advanced students. Olin Hall contains a large number of such rooms designed for the use of individual graduate students or of small groups of two or three advanced undergraduates working together on problems of common interest. Each of these rooms is equipped as a private laboratory and study, and each man to whom a unit laboratory is assigned is free to use it at any reasonable time and for any proper purpose. Problems in conjunction with their courses in plant design are worked on here by the students.

In telling about the origin of Olin Hall (which is sometimes called "the laboratory of chemical

Another view of the machinery for experimental filtration.

engineering at Cornell") it is necessary to go back 25 years. At that time Dr. Rhodes began giving courses in industrial chemistry in Morse Hall. He had in mind a new program of instructions that not only would give students a knowledge of chemistry and of chemical processes on a test-tube scale, but that would also take them through the entire procedure of designing and building chemical manufacturing plants which would operate efficiently and economically. When the Baker Laboratory of Chemistry was completed in 1923, he was given a section covering two floors of one wing, with a main laboratory so arranged that his students were able to build semi-plant scale models of chemical plants they had designed. This method of instruction was the first actual laboratory work in chemical engineering at Cornell. Dr. Rhodes was soon convinced that the usual four-year course was inadequate to train the highest type of chemical engineers. "Chemical Engineers," he explains, "must be competent chemists and also competent engineers besides having specialized training in the practical application of both kinds of knowledge to the design and construction of chemical manufacturing plants." Consequently Cornell offered in 1930 a five-year course leading to the degree of Chemical Engineer, and in 1938, the Board of Trustees gave Chemical Engineering the status of a school. The School of Chemical Engineering offers the degree of Bachelor of Chemical Engineering after a course which normally takes five years but may now, by attendance at summer terms, be shortened to four years.

Now that you have had a look, at least, as to what the chemical engineering laboratories at Olin Hall actually consist of, perhaps you won't judge the chemical engineers at Cornell too harshly when you hear them wailing this pathetic bit of song;

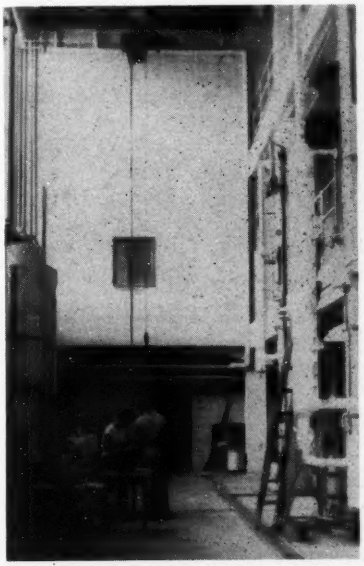
THE CHEM. E. MOAN

Words By: The Fifth Term Chem.E.'s
Music: The Man on the Flying Trapeze

Oh once I was happy but now I'm forlorn
Sometimes I wish I had never been born
From Monday to Sunday I do 710
Next Monday I start it again.
Now coffee I drink by the liter
So I won't fall asleep on this tripe
Calibrating an orifice meter
Or rating the flow through a pipe—
Ohhh

Chorus:

We work through the night with the greatest of ease
All greasy grinds, we are lousy ChemE's



The goal of aspiring chemical engineers —working in the model chemical plant in Olin Hall. These students are in the process of batch distillation.

530 is "micro" and our bedtime too
So don't let it happen to you.
Now if you think that you want to be a Chem E
Then please take a friendly suggestion from me
Try Princeton or Worcester or soft MIT
Don't try for a Cornell degree.
Now Dusty and Mason and Winding
Say ten hours a night is enough
But all that I know is I'm grinding
And bust me if that isn't rough—
Ohhhhh

Chorus:

We work through the night, etc.
My eyes they are failing, my hair is a fright
My fingers are ailing from writing all night
My best friends all shun me, they tell me I reek
And I haven't been shaved in a week.
Now we can't keep this pace up much longer
Or flat on our face we will fall—
There is one hope that daily grows stronger
Uncle Sam puts an end to it all—
Ohhhhh

Chorus:

PROMINENT E

Jim

James E. Edison, ChE '46

THE rather wide variety of names to which Jim Edison answers might cause one to suspect immediately that "here we have a character", and upon further acquaintance, he would find his suspicions to be correct. To those who meet him more or less formally, he is known as Jim; but all his friends have a much greater preference for "Elmer", believing that this fits his Colorado background much better. And of late, the new name of "Cactus" has been initiated, and seems to be progressing very nicely.

At any rate, Jim, Elmer, or Cactus—which ever you please—came to Cornell on a McMullen Regional Scholarship back in those civilian days of '42, after graduating from North Denver High. Between high school graduation and coming to Cornell, Elmer worked for the American Telephone and Telegraph Company, helping to lay the transcontinental underground cable. This work carried him through most of "the rip-roarin' towns" of Utah and Southern Wyoming. If we can believe half of the stories he tells—a pity we can't get some in print—the eight months he spent with "ol' Ma Bell" were far from dull. "After a winter of bucking hip-deep (he didn't say 'hip-deep') drifts and a summer of fighting that continual Wyoming wind," he says, "I was counting on four years of rest and quiet in some nice warm lecture rooms. But little did I know what I was getting into when I stepped into Dusty's Chem E school. It seems like all I've been doing since I came here is write reports and fight snow and wind that make those of the West look like tropical zephyrs." Any Cornellian will agree with his views on Ithaca weather, and from the amount of work we've seen him do, it's easy to understand his feelings towards reports.

However, in spite of the fact that Cactus is a hard-working chemical engineer and also has Navy duties to prey on his time, he has taken part in a great many extra-curricular activities. In his Sophomore year, he was elected to the editorial staff of the Engineer, and at the moment has a humorous—"Cer-

(*Continued on page* 42)

Malcolm Hecht, ChE '46

MALCOLM Hecht, senior Chem E, is widely known to the various sections of the Cornell student body, and for a wide variety of reasons. To the sports fans, he is probably best known as one of the Big Red cheerleaders or as a member of the swimming and baseball teams. To the chronic party-goers, he is best known as a lad who never misses a party and never calls it quits until the last stein has disappeared or the last quivering note laid to rest for another week. To his classmates, he is known as a man always ready to give assistance, no matter how hard-pressed he may be for time. And to the almighty Dusty, he is probably best known as the sailor who quietly walks into the Chem E office in an attempt to get his 710 report, consistently three or four days late, into the stack of uncorrected reports as unobtrusively as possible. But we, his friends, know Mac as a man of boundless humor, of time-tested loyalty, and, of considerable importance, as a very handy fellow to have around when tomorrow's EE problems are not yet done.

It's truly a mystery how he manages to cram so much into so little time—you'll never find him at his desk in Dorm 9 on a weekend—and seldom during the week—and still he drags down grades that are the despair of we who think the Chem E curriculum tough. How he can keep an average in the high eighties and still take an active part in the AIChE, serve as secretary of Tau Beta Pi, act as President of his fraternity, Zeta Beta Tau, maintain his standing as chairman of the "Anti-Party-Poopers" League, and keep up with his Navy duties is rather confusing to us—and, we suspect, to Mac also.

After graduating from Friend's School in his native city of Baltimore, he came to Cornell in the fall of '42, with rather specific instructions from his father—"Learn how to make synthetic gasoline and synthetic tires—fast." Mac is still trying to discover some way to give his father a little interest on his investment, and though to date his nearest solution to the problem consists of some weird benzene mixture, "equally suited for either tires or fuel," he feels that his work here may lead to some rather startling developments. "Startling, to say the least," he muses as he thinks of the still smouldering results of his last experiment. "But aside from this alchemy," he says, "my most outstanding effort so far is that of Contributing Editor to the 'Stag Songster's Songbook' "—a collection of ancient and dishonored ditties which every engineer should own.

Mac's pet gripe is the professor who is so uninterested in his own

(*Continued on page* 36)

Mac

ENGINEERS

John Tully, CE '46

"I'M a long way from home, and I wish I were back there now," was John Tully's sincere comment when asked about his home town. Ever since his first public appearance in Memphis, Tennessee, nearly 20 years ago, he's been busy making a name for himself. Up until the tenth grade, he attended private school. When he transferred to Central High School at Memphis, John was surprised to find that he was ahead of his class and was able to graduate with only one more year's work. During that one year at Central, he was very active in athletics and won his Varsity letter in football and baseball.

There wasn't too great a question in John's mind as to what he was going to do when he graduated from high school. Everything seemed to point to taking up civil engineering at Cornell. His father always encouraged him to study engineering and his brother Bart was a Cornell C.E., class of 1941.

September 19, 1942 is the exact date of John's arrival at Ithaca. Not a great deal of time passed before he became well known on campus. Active in athletics, he played one year of J.V. and two years of Varsity football (many a Cornell fan remembers his great playing in this year's Navy, Dartmouth, and Pennsylvania games). John has also been playing varsity baseball

John

for four seasons, and showed his versatility in the sport when he was successfully changed from first baseman to catcher last season. At present he's out for swimming and is playing for Dorm 16 in some rough and tumble Inter-Dorm basketball games. But all his interests are not in sports. He pledged Psi Upsilon in his frosh year when college life at Cornell and fraternities were synonomous. John is also a member of the Rod and Bob, the Honor Committee of the C.E. School, and the Football Club.

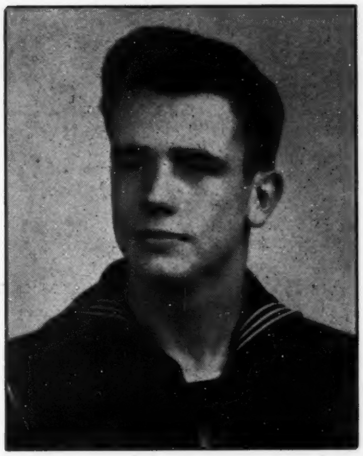
Although he is not in favor of subsidizing athletes, he thinks that Cornell should at least make it attractive for them. Another comment he made about Cornell was that he has a firm belief in the merits of the Honor System of the School of Civil Engineering. The abuse the system receives from some of the lower classmen is more than counter-balanced by the good it accomplishes as the student progresses through the school.

John remembers that time "way back" when he used to spend his summers either at camp (two summers in Wisconsin, two in Colorado) or having a great time around Memphis. Just so that he won't be called lazy, he let us know that he spent one summer busily working in a lumber yard.

John is now in his seventh term which means he'll soon be leaving for Midshipman School. When he graduates in June, he'll be sent to the "C.B.'s" school at Davidsville, R. I. where his brother Bart, just back from overseas duty, happens to be. As far as his distant future plans are concerned, John plans to practice his profession as a Civil Engineer but adds that "I'll probably land up in my father's lumber and transportation business."

John H. Rasch, ME '46

JOHN H. Rasch, a senior ME in the V-12, paused a minute before answering the well-worn query, "What made you choose Cornell for your college training?" Perhaps the question was routine, but the



Jack

answer was not. John had participated in the Scouts organization for five years, becoming an Eagle Scout. He had been active in Scout activities in his home town, Hamden, Connecticut and also in Scout camp. Through his Scout executive and the Cornell Alumni Club, he became interested in Cornell and went up on a weekend in May, 1942 to see for himself. He was immediately impressed by the spirit and friendliness of Cornell and Cornellians. John added, "Looking back on it, I'm glad that I had two terms of peacetime college life at Cornell." He particularly referred to the informal singing, and the parties which, he added, can still be found even during war time, if you just stop a moment to look for them. John finally decided upon Cornell because the engineering curricula here offers a liberal background without sacrificing fundamental engineering knowledge, both of which are of prime importance to the prospective engineer.

In Hamden Hall preparatory school John, or Jack, as he is known to his friends, participated in many sports. Among these he preferred fencing and soccer. He was awarded the Rensselaer Medal for high scholastic standing in mathematics and sciences, giving him an inkling of his aptitude for engineering. However, Jack's interest in Mechanical Engineering did not spring from a sudden urge to throw himself blindly into a professional name. From childhood he had watched and worked with his father in their cellar workshop where they

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NEWS OF THE COLLEGE

Walter L. Conwell, C.E. '07

On February 1, Professor Walter L. Conwell '09, Highway Engineering and Director of the University's Engineering, Science, and Management War Training program, assumed the duties of Assistant Dean of the College of Engineering.

The new assistant dean received the B.C.E. in 1911, was appointed instructor in Civil Engineering as a Senior, and became assistant professor of Railroad Engineering in 1925. He was appointed to the old Athletic Association Council in 1930, following the death of Registrar D. F. Hoy, '91. In 1934 he succeeded Dean Herman Diederichs as president of the Council. Dean Conwell became director of ESMWT in 1942. He has since directed war-training courses for some 16,500 persons in eighteen upState communities; he will continue to direct the program in addition to his duties as assistant dean.

Professor Lynn A. Emerson, Industrial Education, was also recently appointed Assistant Dean of Engineering, and Professor Harry J. Loberg, Administrative Engineering, and Director Herbert H. Williams of the University Placement Service, are assistants to Dean S. C. Hollister.

Tau Beta Pi

The New York Delta Chapter of Tau Beta Pi held an initiation of new members in January. A banquet was held at the New Victoria Inn, attended by faculty members, student members, and initiates. Professor Julian P. Bretz, history, gave the main address of the evening on "Compulsory Military Training After The War."

Leroy R. Grumman, M.E. '16, was initiated as an alumni member.

The following undergraduates were initiated:

Robert A. Bennett
Wilson Breiel
Albert C. Cornish, Jr.
James E. Edison
William Hale Emrick
Orrington C. Foster
John P. Gnaedinger
Charles C. Jamison
Horace R. Johnson
Frank C. King
Irwin H. Miller
Lionel M. Noel
Donald R. Peirce
John H. Rasch
Gordon S. Smith
Maurice H. Welsh

Following the banquet, the students attended a short meeting. Several sweet melodies were sung and entertainment was provided by Professors Mackey, Moynihan, and Wright of the Mechanical Enginneering School. During the course of this meeting, Prof. Mackey was presented with a fine gift as testimonial to his excellence as an instructor by Kenneth L. Campbell on behalf of the entire group. Refreshments and pretzels were served.

AIEE

On January 12, the Ithaca section of the American Institute of Electrical Engineers met in the Franklin Hall lecture room. H. R. Vaughn, Central Station Engineer, Westinghouse Electric & Manufacturing Company, gave a talk entitled "Power System Stability". His talk covered the concept of stability and the power system characteristics that effect it. These charactertistics were discussed and illustrated by means of a mechanical model and slides.

ASME

At a meeting on January 31st, the Cornell branch of the American Society of Mechanical Engineers saw movies on "The Steam Turbine". Professor F. O. Ellenwood gave commentaries on the movie. As part of the current public speaking contest, student speeches were given by Jim Horn, John Kreuter, and Al Brede.

Sibley Club

New in the field of extracurricular activities is the Sibley Club. The club made its debut at the Alhambra on January 26th by sponsoring a steak dinner attended by faculty and students. After the dinner an informal discussion was held in an effort to analyze an engineer and to try to determine just what kind of a job the graduate engineer should accept. The discussion was led by Allan Ginsburgh, ME '47. The faculty members participating in the discussion were Mr. H. H. Mabie, Professor W. A. Johnson, Professor P. H. Black, and Professor W. A. Geer.

The Sibley Club is an inspiration of a group of junior M.E.'s. After an initial meeting, the juniors decided to include M.E. seniors in their organization. Club members hope to take some of the coldness out of Sibley by including in their activities informal discussions and social events with faculty members. It is also hoped that through these discussions the M.E. upper classmen will get a clearer idea of an engineering education and the reasons for taking the courses they do. At the next meeting officers will be elected followed by a discussion on why M.E.'s take courses in the E.E. school.

ALUMNI NEWS

AFTER echoing throughout the land "far above Cayuga's waters," throughout the confines of the Dutch and Zincks, and throughout the halls of many a fraternity house, the words of the Cornell Alma Mater have found their way to the waters of the Pacific. Charles H. Spilman, Journal-Bulletin war correspondent, reported November 13 that Rhode Island soldiers, establishing a new camp on an island near New Guinea, recruited native boys to help with the work, detailing a staff sergeant as their tutor. After several sessions of basic English, they marched to work one morning chanting "Hail to thee, our Alma Mater, Hail, all hail, Cornell!"

The story of the Battle of the Bulge supplies more about Cornellians on our battlefronts. In order to meet the German attack in the St. Vith sector the American Seventh Armored Division split into two combat teams. One of these teams was headed by BRIGADIER GENERAL BRUCE C. CLARKE, C.E. '27. General Clarke's team struck into St. Vith and held that vital road center for five days against six crack Nazi divisions.

General Clarke is a graduate of the U. S. Military Academy and received the C.E. degree in 1927. While colonel and commander of the Fourth Armored Division, he spent more time behind the German lines than in front of them. The youthful tank expert, who is looked upon by Lieutenant General George S. Patton, Jr. as one of the most outstanding combat-team commanders in Europe, won his promotion to general by an end run through France on the flank of the American Third Army. His combat team raced across Brittany to contain the U-boat base at Lorient. Then he turned east and fought to the Moselle River. His crossing of the Moselle with his combat team under fire, to sweep around Nancy and cause its fall, is considered a classic of armored warfare.

NEW Delhi, India, was the scene for the presentation of the Legion of Merit to COLONEL WILLIAM C. KINSOLVING, *EE '23, in recognition of the work he has done on the new India-Burma pipeline, which will soon carry oil to China. The citation says that "the success of the entire construction program is largely due to Colonel Kinsolving's personal leadership and great technical skill."*

January 16th found the CORNELL SOCIETY OF ENGINEERS holding their 2nd Winter Meeting at the Cornell Club in New York City. Mr. N. L. Rea, Supervisor of Electrical Installations for the General Electric Company, gave an illustrated talk on the unusual experiences of their foreign service engineers in far corners of the world. Through the

Presentation of the Legion of Merit to Colonel William C. Kinsolving, E.E. '23. —*Courtesy Alumni News*

courtesy of L. A. Swirbul, '19, Vice-President and General Manager of Grumman Aircraft, members were given the rare treat of a preview of the Navy's latest combat film, "Fighting Lady," followed by talks by Lieutenant Cecil Harris, the Navy's newest ace (with 27 Jap planes to his credit) and Commander Raby, group commander in the attack on the Marcus Islands. In spite of the bad weather, the attendance was so large that it was not possible to accommodate all who desired to be present. There were approximately 150 on hand at the buffet supper and meeting.

According to the New York Times of December 27, 1944, ELMER D. SPICER, *M.E. '12, Vice-president of the General Electric Company responsible for apparatus manufacture, will become a member of the president's staff in charge of employee relations. Mr. Spicer will make his headquarters in New York and will also serve as consultant on general manufacturing processes.*

A talk on the Seabees was given by LIEUTENANT COMMANDER HAROLD SCHOEN, C.E.C.U.S.N.R. before the January meeting of the Kings County Chapter of the New York State Society of Professional Engineers. Commander Schoen obtained the C.E. degree in 1927. Upon graduation he practiced construction engineering up to April, 1942, when he entered the service. He spent considerable time in the Pacific area with the Seabees, and is presently in charge of Naval Hospital Projects for the Metropolitan area of the Public Works Office, Third Naval District.

Sponsor of the Andrew J. Haire Airport Awards, prizes totalling $7500 for outstanding achievement in airport development, is ANDREW J. HAIRE, M.E. '05, *president of Haire Publishing Co. Offered to stimulate individual and community interest in construction of airplane landing facilities, the awards will consist of a first prize of $5000, a second of $1000, a third of $500, and ten of $100. The National Aeronautics Association will appoint a committee to formulate rules regulating the competition.*

Back on the homefront, GEORGE W. LEWIS, M.E. '08 was presented the Spirit of St. Louis Medal "for leadership in direction and encouragement of aeronautical engineering during the past quarter century." Dr. Lewis was the recipient of the Daniel Guggenheim Medal in 1936.

After receiving the M.E. degree in 1908, Dr. Lewis remained as an instructor at Cornell until he received his master's degree in 1910. While at Cornell he was associated with G. B. Upton in the development of a fatigue testing machine, and during the next seven years on the faculty of Swarthmore College he collaborated with H. C. Hayes in

(Continued on page 34)

Dedicated to ye ancient and honourable society of ye chemical engineers in ye belief that Chemicale Engineering is ye one, ye only art.

"Caustic"

By JIM EDISON, ChemE, V-12

LAST month we were one of the fortunate ones who had the honor of giving a pint of our blood to the Rochester unit of the ARC during their visit to the campus.

We say fortunate, for though we had anticipated quite an ordeal and spent the morning resolving to be brave throughout, it was really quite pleasant. Pleasant and simple.

On our way up to Martha Van Rensselaer, we observed a trio of Waves headed in our direction, and we were so engrossed in contemplating them that we followed them right into Martha Van and forgot to worry.

Once inside, we found three charming ba . . . three charming young ladies behind a desk, filling out various forms, i.e., form cards. We boldly went up to the desk and announced, "We are here, girls. Please don't fight over us." At this, three smiles faded simultaneously, and one of the girls started to ask us questions. We found this quite stimulating, and resolved to spend the afternoon in delightful repartee. However, pressure from those in line behind us forced a change of plans.

We stepped into another room, where another girl asked us to sit down. Nothing loathe, we obeyed, and again came questions.

"Do you have tuberculosis?"

"Have you coughed blood recently?"

"Any chronic illnesses or operations?"

"Are you preg . . . oh, damn. I keep forgetting that I only ask the women that."

Whereupon we were sent to the other end of the room, whereat sat still another charming miss. As we sat down, she, with a dreamy look in her eyes, reached for our moist palm. After swallowing a couple times, and congratulating ourselves on our good fortune, we were about to suggest stepping out to someplace a little more private in order to build on this excellent beginning, when she jabbed us severely in the forefinger with a pin. All of which seemed rather unfair, as after all, how did she know what we were thinking?

In somewhat of a huff over this unseemly treatment, we walked into the main room where the real business was taking place. Blood, Mackerel, the place was full of blood. We were helped onto a mattress-covered table, and following the preliminary swabbing, the needle, tube, etcetera, were inserted and the blood started to flow into a small glass container. After a close scrutiny of the bottle, our nurse exclaimed, "Look at the head on that blood! I knew this was too soon after New Year's to try and get blood from them collitch kids." Her amazement increased even more as the liquid in our bottle developed the prettiest two-liquid layer system you've ever seen. Blood on the bottom, and a clear golden fluid on the top—reminded us, strangely enough, of Calverts. The doctor, who was passing by, observed this phenononom, and after a tentative sniff, left strict orders that this particular bottle was to be brought to him, and him alone.

After repeatedly shouting, "Bring on the dancing gals" and fainting three times in an unsuccessful attempt to lure a Nurse's Aide within reach, we were told that the bottle was full, and we could go.

So we left—after eating a goodly number of the Red Cross's doughnuts—resolving to return the next time the unit came to Ithaca. After all, a pint of blood is indeed a small price to see so many beautiful ba . . . to see so many charming young girls in one place. Better than the Palace, yet—which reminds us of one time—but that's another story.

* * *

The dear vicar's wife had just died, and in consequence, he wished to be relieved of his duties for the weekend. So he sent the following message to the bishop:

"I regret to inform you that my wife has just died; I should be obliged if you could send a substitute for the weekend."

* * *

The Sunday school teacher was lecturing to his small charges.

"Now boys, when you grow up, I don't want you to become a bunch of evil-talking men. I want you to show forethought, temperance, and purity in your every thought and word. For instance, a fly just lit on my nose. Do I become excited? Do I blaspheme? No! I just say quietly, shoo fly, kindly go aw— HELLS BELLS, IT'S A BEE!

* * *

We are seriously thinking of heading West, comes the end of the war. Probably to the oil fields of Texas. Yes, we know that Texas doesn't have anything but sand, desert, Gila monsters, and cactus. We know that we'll be a thousand miles from civilization. We know that cactus milk makes mighty poor old-fashioneds. We know all this, but what really appeals to us about that Rio Grande country is that so many girls south of the border finally come across.

* * *

So we close with this tender word of advice. Remember, fellas, all some coeds know about cooking is how to bring a sailor to a boil.

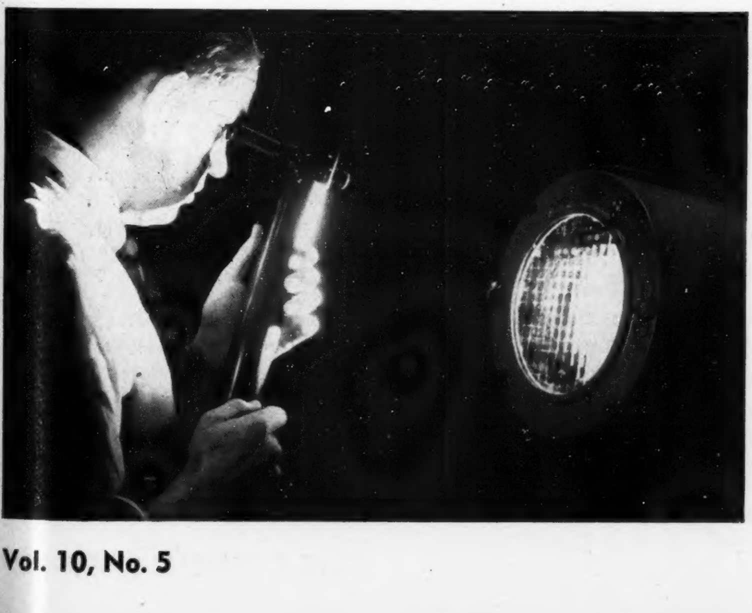
Techni-Briefs

Miniature Searchlight

A miniature signaling searchlight has been developed for smaller craft used in landing operations. The searchlight, only eight inches in diameter instead of 12 or 18, has a range of a mile for all conditions under which landings are normally carried out. It has a venetian-blind shutter which permits signaling twice as fast as controls that depend on turning the light on and off, and hence must wait for the filament to cool after each flash. The lamp has louvers for self-ventilation, yet they are arranged so that absolutely no light can leak out. The great efficiency comes from the use of lamps of the sealed-beam type originally developed for automobiles. Because the reflector is inside the lamp, dulling of reflector surface by corrosion is no problem. Any of three types of lamps can be used without alteration of unit or wiring. These are 300 watt, 115 volt; 150 watt, 24 volt; and 100 watt, 12 volt. Hence the searchlight can be used on almost any kind of power supply, which in this class of service is usually limited in amounts and types available.

An engineer checks the output of one of the new miniature signaling searchlights designed to aid communication in landing operations.

—Courtesy Westinghouse

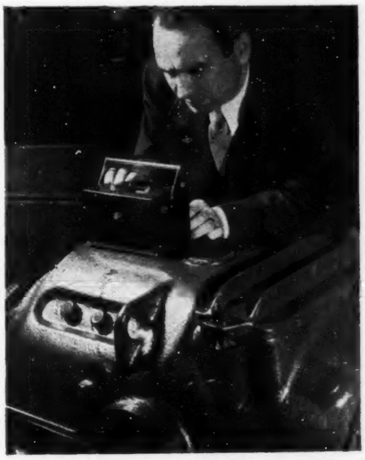


The Vibrograph

ALTHOUGH portable vibration recorders were available in the past, most were large and heavy, and required an external source of power. This made the recording of the vibrations in some remote corners of a plant or in buildings far removed from laboratory facilities difficult.

To facilitate the recording of vibrations on the spot Westinghouse has developed the Vibrograph weighing less than nine pounds and requiring no power connection. In spite of its size it writes a permanent record of vibrations over the range of 600 to 15,000 cycles per minute and amplitudes as low as one ten thousandth of an inch or as great as one sixteenth of an inch. The record and a timing wave are drawn by a stylus on a transparent plastic tape only one inch wide, and has developed the Vibrograph, viewed by low power microscope.

The Vibrograph is purely a mechanical device. It achieves mechanical amplifications of about eight, using the same principle by which earthquakes are recorded. It consists in the main of a frame containing a mass suspended by a weak spring. A pointer attached to the mass indicates relative motion between the frame and mass when the frame is applied to a vibrating body. The Vibrograph makes its mark on the tape either when sitting on the vibrating body or when held in the hand with the vibration being picked up by a prod.



—Courtesy Westinghouse

The Vibrograph, a small portable vibration recorder suitable for use either in laboratories or in remote corners of a plant, is here being used to check an electrical motor.

Supersonic Vibrations

SUPERSONIC vibrations, sound waves too high for the human ear to hear, have found important wartime applications in detection and location, especially in the war on submarines. Recently an important peacetime application, which is probably only a forerunner of a multitude of others, was found for these sounds in the inspection of tires. The Goodyear Tire and Rubber Company has improved and speeded the inspection of their tires by installing supersonic generators and pickups in water baths in which the tires are slowly re-

(*Continued on page 26*)

Cornell Society of Engineers

107 EAST 48TH STREET 1944—1945 NEW YORK 17, N. Y.

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253 Forest Ave., Glen Ridge, N. J.

Mr. Savage

"The objects of this Society are to promote the welfare of the College of Engineering at Cornell University, its graduates and former students and to establish a closer relationship between the college and the alumni."

President's Message

THE time is already here when alert engineers are taking stock of their skills in order that they may find their proper niche in the post war world. To be sure, many of us today, find ourselves in grooves, foreign to our aptitudes and interests, resulting mainly from the "all out" effort of our war industries. It is important to each one's welfare that complacency and smugness resulting from being "fitted" into wartime jobs do not exercise such complete control of our ambitions and vision that the future is left forgotten.

No one can predict the course the world will take after the debris and heartache of World War II has been ameliorated, but this much is certain: more things will be wanted, not only at home but for foreign consumption as well. New products will come on the market; time honored products will be overhauled and paced to meet current requirements; new, unfamiliar ways of doing old, familiar things might well become the order of the day. Advances in mechanical and electrical arts coupled with an accelerated interest in modernizing transportation systems, and the time saving resulting from airplane transportation are factors that will not only spell prosperity for our country, but make for better living as well. The enormous reservoir of public works now being planned by both public and private interests is a challenge to these changing times, which we do not want to go back to the leaf raking days and the doldrum depression of the early thirties. Then, too, the recent developments in social, economic, industrial, and labor fields mandate that the engineer of tomorrow be better informed in order to be better equipped for his job of tomorrow.

How then can your Society serve you in order that some enlightenment and encouragement be brought you in these interesting, ever changing times? It is through the medium of meetings of the Society held not only in New York City but also in other parts of the country, that the Society is of material help. It is through a well balanced meeting program that keeps you posted on developments, not only in engineering, but also in the outside world, that your Society performs an important function so necessary to the welfare of every engineer. In New York, under the direction of John P. Riley, C.E. '21, Chairman, and Ray Kohm, C.E. '24, Vice Chairman, unusually excellent programs have been arranged which have been designed to bring you the best available talent on many diversified subjects. These meetings have been exceptionally well attended, each succeeding meeting bringing larger numbers in attendance, which is a tribute to the programs provided by the Committee. The atmosphere of these meetings is typically Cornellian and opportunities are provided, not only to revive old friendships and memories, but also to meet new Cornell faces. If you have been too busy and have been missing these meetings, I recommend your taking time out and coming to the next one. I am sure you will come again. After all, we too would like to see you, so don't hold out any longer. Incidentally, I am pleased to report that Society membership this year has already exceeded the all-time high membership of last May, by 159. This argues well that the programs have been worth while and that our membership committee under the splendid leadership of Mr. Wilton R. Bently, M.E. '98, is on the job. Watch for notices of coming meetings; without your attendance and cooperation the work of your Society will be in vain.

BERNARD A. SAVAGE, M.E., '25

U. S. Navy Photo

Techni-Briefs

(*Continued from page* 23)

volved. As long as the tire is sound, there is no deviation in the intensity of the sound passing through it. Should there be an air space in the tire, the intensity of the sound picked up decreases, and the inspector is automatically informed of the defect and its exact location.

Refuse Disposal

WHILE city planners are dreaming of post-war cities with parks in every plaza, with two helicopters on every rooftop, and housing developments in every former slum, engineers are making undramatic plans to eliminate all refuse in the town of tomorrow. These engineers believe that the dream city of the future cannot leave the age-old problem of refuse collection and disposal unsolved.

Cities are slaves to refuse cans and surface collection vehicles. City-dwellers are inconvenienced by irregularity of collections due to manpower shortages, mechanical breakdowns and weather conditions. Their health is endangered by putrifying wastes, their safety is affected by storage of combustible wastes, and their comfort disturbed by flying debris, ash dust and scattered garbage. These are the things which will be eliminated by technological advances and post-war changes in refuse collection.

Cities produce 100,000,000 pounds of food wastes a day, 50,000,000 pounds of rubbish, and millions of pounds of ashes. As a result of engineering achievements, food remnants are now being disposed of in thousands of homes by means of an electrical grinder connected to the kitchen sink which macerates the dangerous remnants and flushes them into the city sewer system for disposal with sewage. The garbage can may be eliminated from the post-war city by the universal use of this electrical household device.

Because of the success of grinding food remnants and the elimination of the garbage can by the use of the underground sewer system of a city to remove the wastes without use of manpower to collect and trucks to transport these wastes, engineers vision the time when dry rubbish and ashes will be sucked away from homes through underground pneumatic tubes, like subways, which will completely eliminate the storage and handling of these wastes and their surface collection. Sanitation and convenience benefits are envisioned, and the truly clean city will be a reality.

The system would consist of a network of pneumatic ducts under every street of the city, with a connection in every home, store and industry. An air-lock chamber will permit the property owner to discharge ground-up wastes into the city's refuse 'veins,' from whence they would be sucked to a incinerator which would burn the debris and produce heat and power for the community.

The sizes of the underground 'rubbish man' would range from a 6-inch connection at buildings, to a 12-inch lateral in main streets and a duct as large as four feet in diameter to carry all of the wastes of a city of 100,000 population to the incineration plant.

A special type of conduit would be required to withstand the abrasive action of rough rubbish, bits of glass and crockery and ashes. Booster stations will be needed to maintain the proper pneumatic suction. Repairmen will have to enter the duct system through air-lock chambers or sections of the duct will have to be shut off by special valves to permit repairs.

The system will require a complete re-orientation of engineering ideas but it will change the life habits of community life. The combination of kitchen sink food-waste grinders to eliminate the ills of the garbage can and the cellar grinder and connection to the underground pneumatic duct will end forever the job of visiting the refuse can daily and waiting for the collector weekly.

Baby Dynamometer

THE creation of small high-speed motors for airplanes has been going forward at a rapid pace under the impetus of war. To aid in testing such machines, Westinghouse has developed a new high-speed dynamometer capable of testing machines of 1/100 to ¾ hp at speeds as high as 30,000 rpm. Formerly tests could only be made at speeds up to 20,000 rpm, and performance had to be determined by extrapolation of the curves based on data taken at lower speeds. The new dynamometer has enabled the performance data on the new types of airplane motors to be taken with the greater precision required.

The dynamometer is of the conventional cradle type but uses special low-loss steel in the armature and embodies every known method of providing high bursting strength. For the present no commercial models will be available as it is strictly a laboratory instrument.

Production Control

(*Continued from page* 10)

sonic waves, may yield results. A beam of supersonic waves is very strongly reflected if it falls upon a surface separating two mediums of very different acoustic impedances. For instance, on a surface between metal and air, the reflected intensity is more than 99%. If, therefore, the supersonic beam is passed through a metal plate, the intensity received on the other side will be decreased considerably if an air layer is in the way of the beam. The shorter the wave length, the thinner can be the fissure. Using supersonic waves of 1,000,000 cps, fissures of the order of 1/10,000″ should still be detectable. A figure showing such a "sonogram" is reproduced here. The upper portion shows the intensity of the sound beam after passage through a plate without any fissures, while the beam is moved across the sample at a rate of 1 ft./min. The lower part reproduces an experiment with a plate having two fissures, thinner than 1/1,000″. On the places marked ½ and 1 the intensity drops to nearly zero. This method can be used not only for metals, but also for other substances, and is in use, for example, in tire inspection.

However, not all failures are due to occlusions. Sometimes the structure of the material changes and

(*Continued on page* 30)

Joseph P. Ripley

(Continued from page 15)

of which he later became Vice President.

After careful study of the situation in the aviation industry at that time (1927), he was among those convinced that unification of manufacturing operations and flying service was essential for effective operation. He therefore took steps in this direction by helping to organize United Aircraft & Transport Corporation. Among its constituents were the Boeing Airplane Company, Sikorsky Aviation Corporation, Northrop Aircraft Corporation, Pratt & Whitney Aircraft Company, and the Hamilton Standard Propeller Corporation. Despite difficulties, the corporation achieved outstanding success until it was eventually split up into Boeing, United Aircraft, and United Air Lines.

Currently, Mr. Ripley is Chairman of Harriman Ripley & Co., Inc., and Chairman of the Board of Directors of Cramp Shipbuilding Company; a director of United Aircraft Corporation, of West Virginia Pulp and Paper Company, and of Brown Harriman & Co., Limited, of London. He is a member of the Board of Trustees of Cornell University, and of the Joint Administrative Board of The New York Hospital—Cornell Medical College Association.

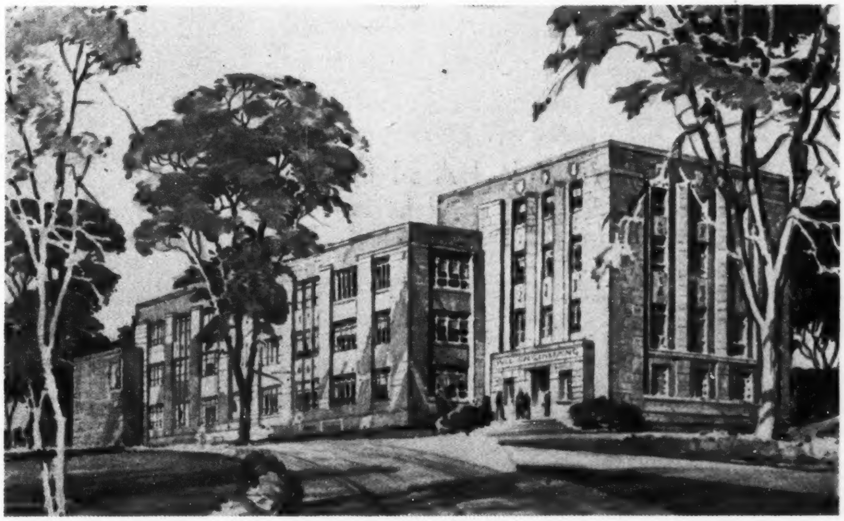
Mr. Ripley's two sons have served in the present war. The younger of these, Warren Ripley, was serving as a private in the Marine Corps when he was killed in action at Tarawa. His elder son, Lt. (j.g.) John C. Ripley, is a naval aviator and has been on active duty with the Fleet Air Arm for the past two years.

Joseph P. Ripley is one of those great men who have effectively applied to industry their training in school and early life. We are pleased to call him a fellow Cornellian.

Cornell's New Engineering College Campus

SITUATED at the south end of the campus, it will occupy some twenty-two acres. The planned group of buildings of the College of Engineering will provide the very latest in laboratory and classroom facilities, functionally integrated for most effective instruction.

THE SCHOOL OF CIVIL ENGINEERING



This is the last of the five main structures composing the new College of Engineering group to be pictured in the Cornell Engineer. It will occupy the area where the temporary Naval Diesel Laboratories now stand, on the east side of Central Avenue, just south of Olin Hall.

Besides housing the new School of Civil Engineering, this building will provide quarters for the central administrative offices of the College of Engineering and for its library.

S. C. HOLLISTER, Dean
College of Engineering
Cornell University

Production Control

(Continued from page 26)

lowers the yield value. This is, for instance, the case in concrete subject to temperature cycles. There, use has been made of another physical property in order to detect such changes at an early stage. This consists of the observation of the elastic losses. In a perfect solid, the work done during a deformation is completely transformed into elastic potential energy, which is again liberated when the deformation is released. However, in a real solid, part of the work done during the deformation is transformed into heat. In releasing the deformation, therefore, not all the energy is regained. The ratio of the energy thus lost to the total work done during the deformation depends very much on the structure of the substance. In fact, in many cases, it is much more sensitive to structural changes occuring in a solid, than the elastic moduli themselves. The elastic losses can be observed by determining the damping of a free vibrating sample or by measuring the width of a resonance curve in forced vibrations. In the case of concrete, mentioned above, an increase in the elastic losses occurs while submitting the sample to temperature cycles long before the other elastic properties show marked changes. Another advantage of the use of elastic losses to determine elastic properties, is that this measurement does not depend on the geometric dimensions of the test piece while the determination of the elastic moduli is very much dependent on these factors.

Stress Distribution

Another very important problem in the field of elastic properties is the determination of stress distribution and of residual stress. Great use is made of wire gauges based on the change of the electric resistance of a wire with tension. Recently, use has also been made of X-ray diffraction methods, which have the great advantage of making it possible to determine residual stresses in a non-destructive way, and this research promises a new useful control tool.

Finally, a few examples of applications in a third big field—the control of geometrical dimensions—may be enumerated. In the case of macroscopic pieces, mechanical devices have been replaced by systems, based on the rectilinear propagation of light and making use of photocells. Interference methods are used as, for example, in the calibration of high precision gauges. Absorption of X-rays can be used for thickness determination (e.g., proposed in the case of hot metal sheets). In the field of microscopic or sub-microscopic particles (powders, colloids), a variety of physical methods are in use or under development. Improvements can be made in the standard method of sedimentation in which the concentration of the particles of a suspension is determined at different times or at different heights in a test cylinder. Instead of doing this by drying and weighing, it can be done by measuring the dielectric constant or by observing the intensity of light scattering, methods that can be made easily self-recording. If the particles are still smaller, light scattering, X-rays, infra-red spectroscopy, and others

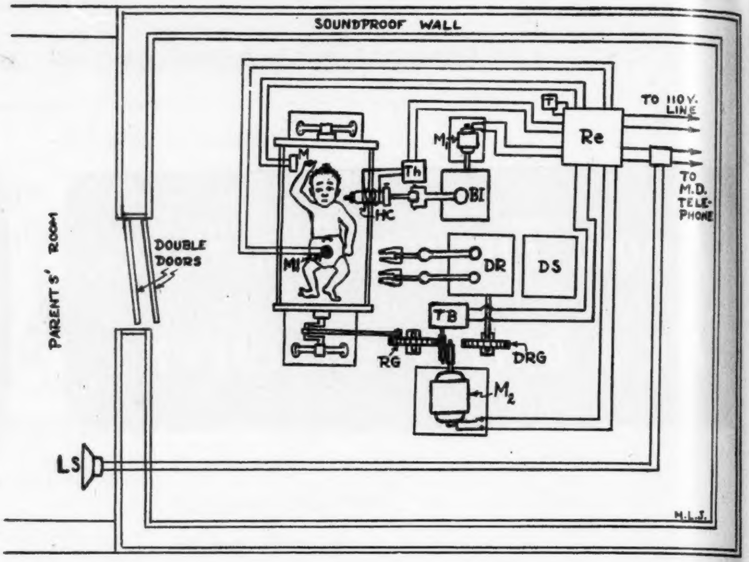
(Continued on page 32)

Production Control

(*Continued from page* 30)

may yield good methods for the determination of the size, and often the shape of these particles.

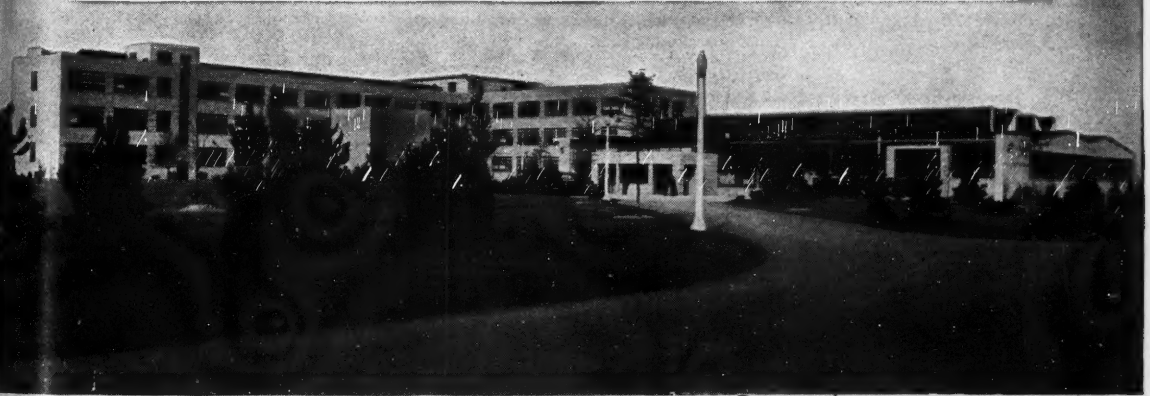
Many more examples could be given of applications of physical principles in control devices. Those given here, however, may suffice to show that there is nearly no field in physics that does not or could not lead to new or better possibilities for production controls. It is just this need for "scanning" the whole horizon of physics, and the intimate combination with a variety of engineering problems, which characterizes this particular field of industrial applications and makes it an interesting as well as a very important domain of activity for the applied physicist.



In this article it was forgotten to point out that control unit based on physical principles will also play a part in domestic problems. This may be illustrated by the accompanying figure, prepared with the artistic help of M. L. Juncosa, and which represents a block diagram of a post war nursery.

If Baby cries, microphone M is activated and puts relay Re and timer T in action. The bottle, heated by coil HC and kept at the right temperature by thermostat Th, is given to baby by bottle injector BI (driven by motor M_1). A suction indicator removes bottle when Baby is finished. If, simultaneously, moisture indicator MI is activated, the diaper changer DR begins to operate (DS: diaper supply). If microphone remains activated motor M_2 begins to rock cradle (over reduction gear RG). If, after predetermined time baby still cries, loudspeaker in parents' room transmits signal, or (depending on the mentality of parents) M. D.'s telephone rings.

H.S.S.

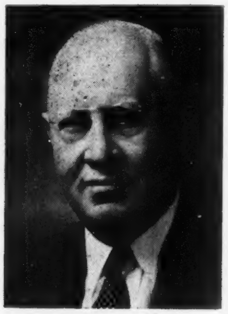


Alumni News

(*Continued from page 21*)

devising a simplified means of determing the elastic limit of tensile-test specimens which resulted in the Lewis-Hayes extensometer.

Under a cooperative arrangement with the Clarke Thomson Research, for whom Dr. Lewis was engineer in charge, he was appointed to the Committee on Power Plants for Aircraft of the National Advisory Committee for Aeronautics. He prepared for the committee the design of the first experimental Roots-type supercharger for aircraft engines. In 1919 he was made executive officer of the N.A.C.A. and in 1924, director of aeronautical research for that body. Dr. Lewis also served as a member of the War Department's Special Committee on Army Air Corps in 1934 and was a plenipotentiary delegate of the U. S. to the Inter American Technical Aviation Conference, Lima, Peru, in 1937. He was president in 1939 of the Institute of Aeronautical Sciences and holds honorary degrees of Doctor of Science from Norwich University and Doctor of Engineering from the Illinois Institute of Technology.



Dr. Lewis
—*Courtesy Mechanical Engineering*

Recipient of the Spirit of St. Louis Junior Award for 1944 was MARTIN GOLAND, *M.E. '40. A paper on "The Influence of the Shape and Rigidity of an Elastic Inclusion on the Transverse Flexure of Thin Plates," presented at the A.S.M.E. 1942 Annual Meeting and published in the Journal of Applied Mechanics in June, 1943, won him the award. Mr. Goland is head of the applied mechanics section of the structures department at the Research Laboratory of the Curtiss-Wright Corporation, Buffalo, N. Y.*

Upon graduation from Cornell,

(*Continued on page 40*)

WHO SAID IT ?

See if you can match the person with the saying. Answers may be found on page 40.

........F. O. Ellenwood
........J. N. Goodier
........J. R. Moynihan
........W. R. Cornell
........P. H. Black
........M. W. Sampson
........C. B. Reemelin
........M. S. Priest
........H. C. Perkins
........W. A. Hurwitz
........J. H. Smith
........J. O. Jeffries
........J. W. FitzGerald
........L. T. Wright
........W. L. Koch

1. "Now would that be all right?"
2. "You ME's ought to know this."
3. "If there are no further questions, that will be all."
4. "Now, we can make the amplitude as small as we like."
5. "Notice the cigar shaped fuselage."
6. "Bank of Ithaca, one-oo-one."
7. "Let's take a small element and consider the forces acting upon it."
8. "You boys do not REALIZE the full meaning of Section 201."
9. "Let's have a little check-up."
10. "Let's take a free body."
11. "Do you realize how much a million dollars is?"
12. "Ha, ha, ha, ha, ha."
13. "Let us consider this nauseatingly simple, trivial, inconsequential example."
14. "Now here is an example of what I mean: Joe Doakes and Arnie Blye walkin' by the Old Man with their hands in their pockets."
15. "—just below the mezzani-i-ine."

Malcolm Hecht

(*Continued from page 18*)

course that he can't interest the students in his classes. "I don't want the guy to go to the other extreme and consider that his course is omnipotent," he explains, "But after all a teacher can either make or break a course, and when some of them take the attitude that 'I can't waste my time on this rubbish—youse punks can dig it out of the book if you want,' it's pretty fatal."

God and Dusty willing, Mac will graduate in June with a BS in ChE, but his plans for the future are somewhat hazy. "Because several signatures of mine rest on certain papers down at the Navy Bupers in Washington, I don't feel that I have too much to decide about my immediate future," he states. "But after the war, I want to return and complete the required work for a B ChE, and then go into some phase of the petroleum industry."

John Rasch

(Continued from page 19)

made such items as grandfather clocks, furniture, and other articles of fine craftsmanship. Jack commented that through this work he acquired the valuable knowledge of how to use and care for tools, and especially how "to do a job right." He went on frequent trips with his father, who is Engineer of Building Inspection for the Southern New England Telephone Company, during which he learned the many intricacies of applied engineering. However, all these trips with his father were not confined to the furtherance of his interest in engineering. Many a summer day was spent with his father, fishing at Squam Lake in New Hampshire or at their summer cottage in Connecticut. During his vacations, Jack frequently went hiking, sailing, and canoeing. One of his excursions was a nine-day mountain hike through the beautiful White Mountains of New Hampshire. Jack prefers the sunny panorama of the Franconian trails to those of the traditionally misty and cairn-strewn Presidential Range. On his last summer vacation before entering college, he worked on a state experimental farm which interested him greatly. Here he came in contact with college men some of whom came from Cornell and who informed him of many parts of Cornell life.

The thing which impressed Jack most when he first came to Cornell in September, 1942 was Frosh Camp in which all the incoming freshmen got together and made friends. He believes this peacetime program helped to build up lasting friendships and good college spirit, and he has always hoped to go back some day to Frosh Camp as a counselor. Jack joined Alpha Delta Phi fraternity in his freshman year; and, that winter, he went out for Varsity fencing. Two summers ago he tried out for crew and immediately fell in love with the sport, proceeding to make the Junior Varsity. He hopes to make the Varsity crew this season.

In his sixth term, Jack became a member of the A.S.M.E. and of Atmos, of which he is now secretary

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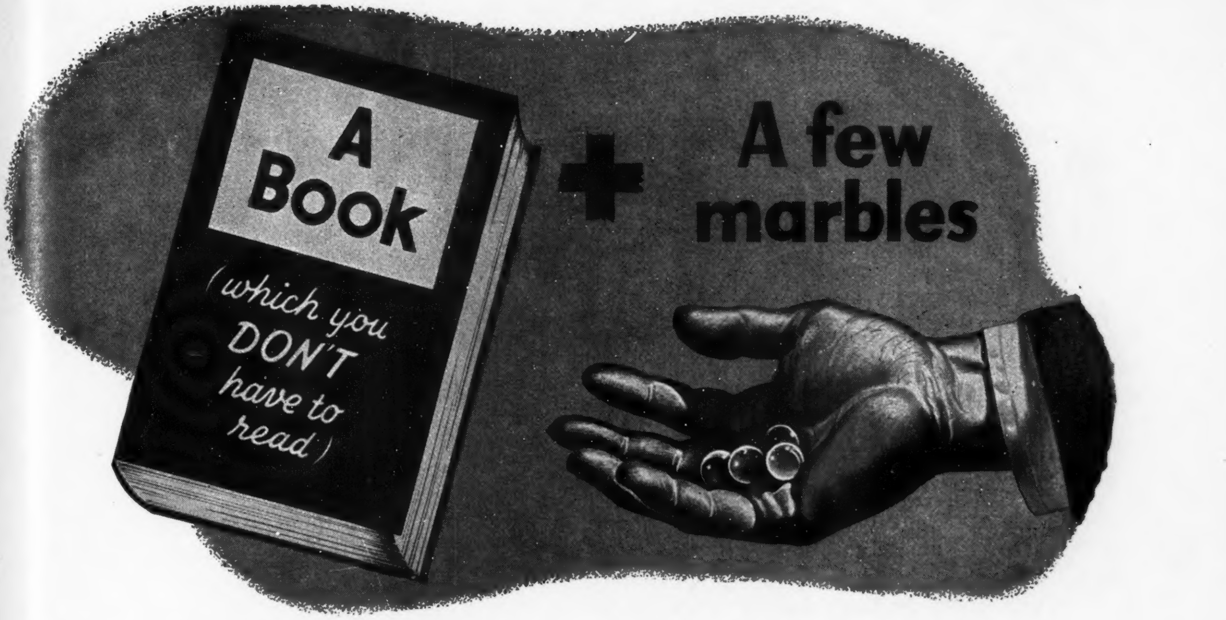
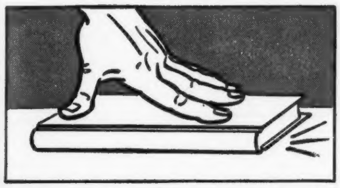
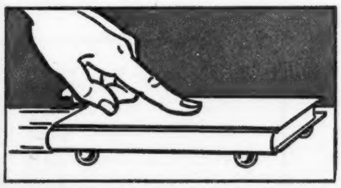


tells the WHY of Ball Bearings



TRY THIS: Place a book on your desk and your hand firmly on it. Then try to push the book across the desk. That's the principle of *sliding motion*—hard on book, desk and energy.



THEN THIS: Place 4 marbles under the book, your hand on top—and push. The marbles roll freely, the book moves easily in any direction. That's *rolling motion*—smooth and easy on everything!

Cut-away view of New Departure Ball Bearing

There is a simple, fundamental truth in the principle of the ball bearing: "Nothing Rolls Like a Ball!"

The ball possesses inherent advantages unequalled by any other rolling body. There are no *ends* to a ball—so its axis of rotation need never be artificially fixed.

Thus, a *Ball* bearing bears the loads on a circle of *free rolling* steel balls, reducing friction and wear, maintaining precise location of parts and cutting maintenance time—as does no other type bearing.

That is why over 300 million New Departure Ball Bearings are at work in this war. *That* is why designers of peace-time machinery are designing more ball bearings into their machinery than ever before.

There is really no substitute for the ball bearing—nor any substitute for the technical experience and creative engineering that go into New Departure Ball Bearings.

Ask for your free copy of "Why Anti-friction Bearings?"

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John Rasch

(*Continued from page* 38)

and treasurer. Jack was recently elected to Cornell's Tau Beta Pi. Jack's varied activities and high scholastic record are indeed sufficient to satisfy the most exacting student advisor. When he came here, Jack had the idea that he would get in four years of college, including three summer vacations. However, he had not counted upon the war emergency which has almost halved his time here. He still believes that the full four years are needed to build a solid background for engineering and that the summer vacations will, after the war, be a very necessary part of a college career in which time may be found to think over and apply the training of previous terms, and also to make plans for the future. It is for these same reasons, he says, that he is also in favor of the plan for a five year course. Jack's plans for the immediate future are directed toward Midshipmen's School and an engineering commission. But he hopes later to go into post-graduate work in some special field after having obtained all the fundamentals of Mechanical Engineering, and a B.M.E. degree.

Jack's postwar outlook is far from leisurely. He believes a person will have to have a liberal background in addition to specialized knowledge to make good after the war in competition with the many men who are now being technically trained. Jack hopes to gain this liberal background through his courses at Cornell.

Alumni News

(*Continued from page* 34)

Mr. Goland remained as an instructor in mechanics of engineering before entering the employ of Curtiss-Wright Corp. He has also been a member of the staff of Engineering, Science, and Management War Training in Buffalo for two semesters.

LIENTENANT EARL S. ROSENBLUM, USNR, M.E. '36, has given up the gold braid of a Naval officer and is now Private Rosenblum, USMCR, a member of Platoon 600, Third Recruit Battalion. He served in the Navy as an aeronautical engineer before his resignation November 7. He says: "I wanted to get overseas and get in the fighting, and I think I have taken the surest way to get there quick."

WHO SAID IT?

Here are the answers to the quiz on page 36. If you have any similar quotations, please send them to THE CORNELL ENGINEER, Lincoln Hall, Cornell University, Ithaca, N. Y.

8......F. O. Ellenwood
4......J. N. Goodier
15......J. R. Moynihan
7......W. R. Cornell
1......P. H. Black
11......M. W. Sampson
14......C. B. Reemelin
12......M. S. Priest
10......H. C. Perkins
13......W. A. Hurwitz
2......J. H. Smith
9......J. O. Jeffries
6......J. W. FitzGerald
3......L. T. Wright
5......W. L. Koch

Jim Edison

(*Continued from page* 18)

tainly it's humorous," he says—page to himself. He is a member of the AIChE and was elected to Al-Djebar, honorary Chem E society, in his junior year. And on top of all this, he managed to sing a not too mellow second tenor in the Chem E quartet. Pledged to Alpha Chi Sigma in his freshman year, he seems to miss most of the house meetings, but attend all of the parties, given by that organization.

In spite of these somewhat diverse activities, Elmer's scholastic record doesn't seem to have suffered too much. Proof of this was given when he was elected to Tau Beta Pi a few weeks ago.

If there is one thing that Cactus would die without, it would surely be his pipe. It is seldom indeed that anyone comes into his room without finding Elmer smoking one of his many pipes. Probably next to this, he likes to sing, and his repetoire of songs is boundless. (This might be said of his jokes too—it's darn near impossible to find one he hasn't heard, read, or published in "Caustic".) As for women, the first thing that comes to mind is some pearly words of wisdom that he is wont to repeat quite often. According to Cactus, "The best way to get over one girl is to find another—fast." He seems to be doing fine. Much of Elmer's time is spent defending his homeland, Colorado, against the rather imaginative views that his roommates have of it. After hearing him sing its praises for about a year and a half now, we're beginning to suspect that he really likes the place. We found out a while back that in his "younger days" Cactus used to play the guitar—this fits in perfectly with our (his roommates') view of him as a lad on the Western praries.

In all seriousness, though, if there is anything that we who have lived with him for the past year and a half can say that would characterize Cactus's character, there would be only two things that we could say; first, he has a priceless sense of humor, and, secondly, there are few people who would be easier to get along with.

On The Air!

(*Continued from page* 14)

including the Battalion Dances, the basketball games and other sports events, and the large dances originating from Barton Hall.

Today, students interested in radio and desirous for an extracurricular activity are getting training in radio announcing, engineering, programming, sales, continuity, and publicity. Many of the former members are now doing professional radio work.

Post-war will probably see a great expansion in CRG's coverage and equipment. A transmitter for the College Town area, and capacity for complete coverage of the whole campus are needed most. There is a dearth of space also, and a new site for a larger studio is being sought. Wartime restrictions have held back the growth of CRG's equipment and space which would normally correspond with the increasing interest in CRG displayed by Cornell students.

Cornell may well be proud of CRG—symbol of an enterprising and active student body.

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STRESS *and* STRAIN..

God made a machine; the machine
made men:
Doctors, lawyers, priests, and then,
The devil got in and stripped the
gears,
And turned out the first batch of
engineers.

* * *

Then there was the electrical engineer's daughter who had no resistance, infinite capacity, and was easily induced . . .

* * *

I never kiss, I never neck,
I never say hell, I never say heck;
I'm always good, I'm always nice,
I play no poker, I roll no dice.
I never drink, I never flirt,
I never gossip or spread the dirt;
I have no line or funny tricks,
But what the hell, I'm only six!

* * *

A SONNET ON CE 270

I stood on the bridge at midnight,
('Twas the suspension span)
And my fingers were held fixed-
ended
In the clasp of my love—dear Anne.
And I sighed as I there surveyed
her,
My love so passing fair,
While a sporting wind sudden
Caused tensile stress in her hair.
"Oh Anne, wilt thou walk beside me
Along life's hard-surfaced road?"
On my ribs' spiral reinforcement
My heart set up an impact load.
"Oh Anne, beam thou upon my life;
I pray thee, do not dim it."
And my joy when she whispered
"Yes"
Exceeded the elastic limit.

* * *

A sailor on leave, who had been stopping at a fashionable hotel, was paying his bill. He looked up at the girl cashier and asked what it was she had around her neck.

Girl: That's a necklace, of course. Why do you ask?

Sailor: Well, everything else is so high around here. I just thought it might be a garter.

Note to female Home Ecs: Dr. Keys, University of California Family Relations Professor, states, "Engineers make the best husbands."

To which we add, "Red-heads make the most."

* * *

"Beauty is only skin deep."
That's bosh.
It's thinner than that . . .
It comes off when you wash.

* * *

"Are you positive that the defendant was drunk?" asked the judge.

"No doubt," growled the officer.

"Why are you so certain?"

"Well," replied the officer, "I saw him put a penny in the mail box, look up at the clock on the Libe tower and shout: "By God, I've lost fourteen pounds!"

"Please Miss Howard, you've ruined my setting."

* * *

You kissed and told,
But that's all right;
The guy you told
Called up last night.

* * *

A certain brewer sent a sample of his beer to a lab to be analyzed. A few days later he received a report from the chemist—

"Dear Sir,

Your horse has diabetes."

There are times when they are
alone and they sit
togetherlikethis.
But when the chaperone comes into the room she always finds them like .... this.

* * *

A Cornellian arrived at the pearly gates where St. Peter asked him who he was. When he said that he had been an Arts student, St. Peter said "Go to the Devil!" The next Cornellian arrived and upon being asked by St. Peter who he was, replied that he was an architect; he was told to go to hell. The third Cornell man arrived and knocked on the pearly gates with his sliderule. When asked who he was, he said "I'm an engineer." "Come on in, Mister. You've been through hell!"

* * *

"And where is Seaman Jones?"

"A.W.O.L."

"And what does that mean?"

"After women or liquor."

* * *

The minister read the text: "The light of the wicked shall be put out."

Instantly the church was in darkness: "In view of the startling fulfillment of this prophecy, we will spend a few minutes in silent prayer for the electric light company."

* * *

A newly married couple were stopping at a large New York hotel. One day during the course of their honeymoon the bride went out to do some shopping and upon returning could not find her room. Finally, tripping up to what she thought was her room, she tapped on the door and called:

"Honey!"

No answer.

"Oh, honey, I'm back now. Let me in, honey."

There was silence for several seconds. Finally a man's voice, cold and full of dignity, came from the other side of the door.

"Madam, this is a bathroom, not a beehive."